COMPARISON OF DAY TIME VERSUS NIGHT TIME MANAGEMENT IN MECHANICALLY VENTILATED CHILDREN

A THESIS SUBMITTED TO BABA FARID UNIVERSITY OF

HEALTH SCIENCES, FARIDKOT (PUNJAB)

IN THE PARTIAL FULFILLMENT

FOR THE AWARD OF DEGREE OF

DOCTOR OF MEDICINE

IN

PAEDIATRICS

2024

Submitted By

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ACKNOWLEDGEMENT

I am highly grateful to the Almighty, without whose blessings no work can be completed. He is the one who holds our hand and guide us through every step.

I take this opportunity to thank all those who have been helping me in successful completion of this work.

With a deep sense of gratitude, I wish to convey my thanks to my esteemed teacher Dr Siddharth Bhargava, Associate Professor, Department of Pediatrics, DMCH, Ludhiana for being so supportive throughout, His able and mature guidance made the assigned task easier to accomplish. His indelible help at all stages helped me a long way in compilation of this project.

It is with great reverence and profound pleasure that I acknowledge the valuable suggestions by my co-supervisor Dr Puneet A Pooni, Professor and Head, Department of Pediatrics, DMCH Ludhiana. Her constant encouragement during whole time helped me in completing this project.

I also wish to thank all my teachers Dr Deepak Bhat, Dr Jatinder Singh Goraya, Dr Gurdeep Singh Dhooria, Dr Kamal Arora, Dr Shruti Kakkar and Dr Karambir Singh Gill.

I am indebted to my seniors cum teachers Dr Mehak, Dr Anupreet, Dr Himanshu, Dr Bhavna, Dr Vishal and Dr Akshay for their encouraging words, support and guidance throughout the duration of thesis.

I also want to thank my seniors Dr Amneet, Dr Mitali, Dr Navneet and Dr Harpreet who thought me every intricacy of being a good pediatrician despite all odds.

My Thanks to my colleagues Dr Savi, Dr Kirti, Dr Veronica, Dr Lovepreet, Dr Amandeep, Dr Asmita for their brilliant company in this journey. They have been invaluable support day in, day out for the entire work.

I would also like to thank all my juniors who have helped me to complete my project.

I am really grateful to my friends- Akshit, Rajat, Gopal, Deepak, Nehal, Meenali, Janvi, Romi, Baljinder, Divjot, Didar, Kanav, Yesha, for standing by me through thick and thin. They have been greatest mental support throughout these years.

My Special thanks to Pushpa ji for being a stress buffer for all residents.

I would like to express my deepest gratitude to my beloved grandmother Shmt Sudarshan, her unwavering support, love and wisdom have been a constant source of strength and inspiration throughout my academic journey.

Words are inadequate to express my sense of gratitude to my father Mr Khemdeep Khullar and my mother Mrs Neelam Khullar for their unconditional love and support that helped me sail through all hard times.I feel blessed to have my elder sister Ankita and brother in law Mr Abhinav for continuous support, help and encouragement in all walks of life.

I would also like to thank my Nephew Tashvik, he brings immense joy and inspiration into my life. His laughter, curiosity and boundless energy reminds me of the importance of perseverance and beauty of discovery.

I would like to extend my heartfelt gratitude to all my relatives. Their collective support, encouragement and love have been invaluable to me throughout this journey.

Thanks to all patient who have been a part of this study.

Dr. Mayank Khullar

LIST OF ABBREVIATIONS

DMCH	Dayanand Medical College and Hospital
FiO2	Fraction of inspired oxygen
IQR	Interquartile Range
MAP	Mean Airway Pressure
PICU	Pediatric Intensive Care Unit
PIP	Peak Inspiratory Pressure
PRISM	Pediatric Risk Of Mortality Score
SpO2	Peripheral Capillary Oxygen saturation
VIS	Vasoactive Inotropes Score

ABSTRACT

Introduction: Outcome of sick children admitted to Pediatric ICU depends upon many factors such as the severity, reversibility of the illness and the overall prognosis of the disease. The quality of health care delivered is another important determinant in deciding patient outcomes. There is evidence to suggest that there may be appreciable differences in the delivery of healthcare between day and night shifts in the ICU due to various reasons.

Aim of the Study: 1) compare the difference in utilization of intensive care resources including level of respiratory support, vasoactive infusions and other such modalities in pediatric ICU between day and night shift

2) To compare the differences in the indicators of pediatric ICU care and outcomes including accidental extubation, extubation failure and incidence of mortality between day and night shift.

Materials & methods: A prospective Observational study done on critically ill children from 1 month to 18 years of age presenting to the pediatric ICU of DMCH, Ludhiana. After taking informed consent the usage of ventilatory parameters, Diuretic and Inotropes along with important components of outcomes in PICU was compared between day and night shift. P value which was less than 0.05 was considered significant.

Results: Our study found statistically significant difference with regard to mean diuretic usage, vasoactive agent usage and FiO2 utilization; night time usage being significantly higher compared to daytime.

Conclusion: The study revealed that there was significantly greater utilization of PICU resources like vasoactive agents (inotropes) and diuretics during the night.

With regard to mechanical ventilation, greater utilization of Mean Airway Pressure (MAP) and lesser usage of oxygen was observed during daytime. Ventilated children attained better oxygenation (SPO2) during the day despite lesser delivery of oxygen (FiO2).

Keywords: MAP, FiO2, PIP, VIS, PICU.

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INTRODUCTION

The need for mechanical ventilation is the most common indication for children admitted to intensive care unit [1-3]. Approximately 50 percent children admitted to pediatric ICU require mechanical ventilation[4]. Mechanical ventilation represents a cornerstone intervention in the management of critically ill children, providing vital respiratory support to those unable to sustain adequate oxygenation or ventilation independently. The management of mechanically ventilated children demands precision, vigilance, and adaptability.

Within the PICU, the care of mechanically ventilated children is characterized by a multifaceted approach encompassing ventilator management, hemodynamic support, fluid and electrolyte management, sedation and analgesia, and prevention of complications such as ventilator-associated pneumonia and accidental extubation, thus extending beyond mere respiratory support to encompass the optimization of various parameters crucial for patient stability and recovery.

In the continuum of pediatric critical care, the management of mechanically ventilated children unfolds across different shifts, each characterized by its unique challenges, dynamics, and clinical priorities. Daytime care is often marked by heightened activity, multidisciplinary rounds, frequent planning and interventions. In contrast nighttime care presents its own set of complexities, including reduced staffing levels, altered patient physiology, and the potential for sleep disturbances resulting in reduced attention span and cognitive ability of health care professionals.

The outcome of a patient in an ICU generally depends upon multiple factors, including the severity of the illness, the nature of the disease, its reversibility and the quality of healthcare delivered. Further, the quality of healthcare delivery depends upon various factors which affect the performance of healthcare providers. Past and recent

literature indicates that the cognitive performance of ICU physicians and nurses tends to decline for various reasons during night time shifts[5-7].

In addition, it is a general observation that ICU resources including oxygen and pressure delivery through mechanical ventilation, vasoactive agents, diuretics etc tend to be overused during night time shifts with the concern of maintaining vital functions and ensuring patient survival. ‘The more, the better’ seems to be the general notion amongst resident doctors with regard to the utilization of these resources. The difference may stem from the fact that day time is the usual time when more active planning and decision making takes place in the ICU. Hence, resource utilization is expected to be more judicious during this period. This over-utilization may help to achieve certain short term gains, but can result in potentially harmful the long term consequences like oxygen toxicity[8], ventilator induced lung injury or inappropriate management of shock.

The optimization of resource utilization is a central tenet of modern healthcare delivery, driven by the inputs to deliver high-quality care while ensuring cost-effective allocation of resources.[9] In the context of pediatric critical care, the judicious use of resources is paramount, given the vulnerable nature of the patient population and the finite availability of healthcare resources. Understanding how management practices vary between day and night shifts is crucial for optimizing resource allocation, enhancing patient outcomes, and improving the overall efficiency of care delivery in the PICU.

This thesis seeks to address this gap by conducting a comprehensive comparison of daytime versus nighttime management in mechanically ventilated children, focusing on parameters such as delivery of ventilatory pressure, FiO2 delivered, fluid bolus administration, diuretic usage, mortality rates, extent of vasoactive agents utilisation, and the incidence of accidental extubation.

The findings of this study hold significant implications for clinical practice, healthcare policy, and future research endeavors in pediatric critical care. By elucidating the differences in management practices and outcomes between day and night shifts, this research aims to inform clinical decision-making, optimize resource allocation strategies, and ultimately improve patient outcomes in the PICU.

Understanding the nuances of care provision during different shifts is essential for optimizing patient outcomes, enhancing resource utilization, and mitigating risks associated with critical illness. There has been increasing interest in factors determining the quality of care provided in PICU during night, holiday or weekends

It is important to know how management practices vary between day and night shifts is crucial for tailoring care delivery to the unique needs and challenges of each time period. By identifying areas of disparity and opportunities for improvement, this research has the potential to enhance the quality, safety, and efficiency of care provision in pediatric critical care settings, ultimately benefiting mechanically ventilated children and their families.

In order to investigate these facts, we plan to audit and analyze if any significant differences exist with regard to the delivery of healthcare and resource utilization between day and night shifts in Pediatric ICU.

Despite the critical importance of efficient resource utilization in pediatric critical care, there remains a paucity of literature specifically examining the comparative dynamics of daytime versus nighttime management in mechanically ventilated children. While individual studies have explored various aspects of care provision during different shifts, there is a need for comprehensive analyses that encompass a wide range of parameters and outcome.

This study explores the comparative dynamics of daytime versus nighttime management in mechanically ventilated children, focusing on a spectrum of parameters critical for patient care and resource

utilization. The parameters under investigation encompass key facets of ventilator management, fluid and medication administration, patient monitoring, and clinical outcomes. By systematically examining the differences in management practices and outcomes between day and night shifts, this research aims to elucidate the impact of shift-related variations on patient care and resource utilization in the PICU and act as an audit,while providing opportunities for further improvement.

In summary, this thesis represents a critical step towards optimizing resource utilization and improving outcomes in mechanically ventilated children, with goal of ensuring the provision of high-quality care across all shifts in the PICU.

AIMS AND OBJECTIVES

1) To compare the difference in utilization of intensive care resources including level of respiratory support, vasoactive infusions and other such modalities in pediatric ICU between day and night shift.
2) To Compare the differences in indicators of pediatric ICU care and outcomes including accidental extubation, extubation failure and incidence of mortality between day and night shift.

REVEIW OF LITERATURE

Mechanical ventilation is used to maintain adequate lung function in critically ill patients. The benefits and harms of ventilator not only depend on operators setting of machine but also on ventilator derived parameters[10-11].

Various terms associated with ventilator has been described in literature[12-14]

Peak inspiratory pressure (PIP): It is the maximum pressure recorded during the inhalational phase of mandatory breaths.

Mean airway pressure (MAP): Corresponds to the mean alveolar pressure and represents the stress applied to lung parenchyma during ventilation.

Fraction Of Inspired Oxygen: Amount of oxygen in the inspired gas mixture.

SPO2: Also called oxygen saturation, it is the amount of oxygen saturation of hemoglobin in arterial blood

Vasoactive -inotropic score[15-16]: It is the quantity of sum of all inotropes and vasoconstrictors administered reflecting pharmacological support to cardiovascular system.

Numerous studies have investigated the differences in resource utilization and outcomes between daytime and nighttime care in pediatric ICUs. The medical literature indicates that acutely ill patients receiving care during nighttime or weekend hours often experience poorer outcomes compared to those treated during daytime hours.

Previous research has highlighted notable variations in mortality risk due to several factors. These include a higher number of at-risk patients during weekends or evening hours, differences in how and when patients seek medical care, socioeconomic status, and lifestyle choices.

There is another major difference in care during day & night in intensive care units, for in stance, most of the investigations like chest x rays, blood tests, weight-height measurement, etc are done in the morning time while use of analgesics, sedatives, diuretics etc is more in the night shift so that patient is able to sleep peacefully throughout the night and receive adequate rest.

Literature Review: Comparison of Daytime vs. Nighttime Management in Mechanically Ventilated Children

A retrospective study by Eric D. Hixson and colleagues aimed to determine the impact of weekend or evening admissions on mortality in a pediatric intensive care unit (PICU) staffed 24/7 by board-certified pediatric intensivists. The study included children admitted to the PICU from August 1996 to December 2003, ranging in age from 0 days to 21 years. The researchers found that crude mortality rates were significantly higher during weekends and evenings. However, after conducting multivariate logistic regression analysis, they concluded that weekend admissions, weekend discharges/deaths, and evening admissions did not have a significant independent effect on mortality risk, either for the entire sample or for the subset of emergency patients.[17]

Another study by Hannah Wunsch et al., conducted from 1995 to 2000 in 102 adult ICUs across England, Wales, and Northern Ireland, aimed to investigate whether hospital mortality was linked to the day of the week or the time of admission to intensive care units (ICUs). The researchers concluded that there were no significant differences in hospital mortality based on the day of the week or the time of day when patients were admitted to the ICU.[18]

Jeremy M. Loberger et al. conducted a retrospective cohort study in a 24-bed tertiary care Pediatric Intensive Care Unit (PICU) to compare extubation outcomes between daytime and nighttime shifts. The study included 517 mechanically ventilated children. The extubation failure

rate was 10.3% for the daytime shift and 8.1% for the nighttime shift (p = 0.40). Logistic regression analysis at the individual subject level indicated that the timing of extubation (day vs. night) was not associated with extubation failure. They concluded that extubation failure was not independently related to the shift during which the child was extubated.[19]

Jeremy M. Loberger et al. conducted a prospective longitudinal cohort study at the Children's of Alabama Pediatric Intensive Care Unit (PICU) to investigate potential differences in the administration of analgesic and sedation medications to mechanically ventilated children between daytime and nighttime. A secondary objective was to evaluate nursing attitudes and practices regarding the administration of these medications. The study concluded that there was no significant diurnal variation in the amount of analgesic and sedation medications administered to mechanically ventilated patients in the PICU.[20]

Vijai Williams, Nishant Jaiswal, and colleagues conducted a study at PGI to examine the relationship between the time of admission and mortality among children admitted to a pediatric intensive care unit (PICU). The study included observational data on in-hospital mortality and admission times for patients under 18 years of age. They found that weekday admissions to the PICU were associated with lower odds of mortality. No significant differences in mortality odds were observed between day versus night admissions or regular hours versus off-hours admissions. However, they noted that the evidence was of low quality and recommended larger prospective studies for more definitive conclusions.[21]

A retrospective cohort study was conducted by Bryan R. Tischenkel at 2 tertiary care academic hospital to compare daytime versus night time extubations in adult ICU. They had taken total 2240 extubations out of which 1555 were extubated during daytime and 685 during nighttime. Of these extubated during day 119 (7.7%) got reintubated within 24 hours while 26 (3.8%) got reintubated within 24 hours who were

extubated during nighttime. The likelihood of getting reintubation was less for nightime than daytime after multi variable adjustment (OR 0.7, 95% confidence interval 0.3-0.9,p= 0.01,similar trend was seen for reintubation after 72 hours (OR 0.6,95% CI=0.3-1.0 ,P=0.06).They concluded that nighttime extubation did not have higher likelihood of reintubation.[22]

Francois maltese et al conducted a prospective observational comparative, randomized cross over study with objective to study of effect of night shift on cognitive performance of ICU physicians in France .The study concluded that the cognitive abilities of intensive care physicians were significantly impaired after a night shift in the ICU, irrespective of their professional experience or the amount of sleep they had during the shift.[23]

April D. Miller et al. carried out a retrospective study in 2008 to analyze medication error rates over a one-year period, comparing daytime versus nighttime shifts and weekdays versus weekends in a children's hospital. They reviewed 140 reported errors from January to December 2008, classifying them by type and severity based on established standards. Two investigators independently classified the errors, with a third investigator specializing in pediatric pharmacy resolving any discrepancies. Pharmacy records provided data on doses dispensed. The study found that medication error rates were higher during evening and nighttime shifts compared to daytime shifts and higher during weekends compared to weekdays.[24]

Maisoon Abdullah Ghaleb, Nick Barber, and colleagues conducted a study to systematically locate and review research on the incidence of medication errors in pediatric inpatients and to identify common errors. They performed a systematic search of databases for studies related to medication errors in children. The review found that dosing errors were the most common type of medication error, often involving doses that were ten times higher than required. Antibiotics and sedatives were the drug classes most frequently associated with these errors. The

interpretation of the literature was complicated by variations in definitions, research methods, and settings used by different studies, as well as a lack of theory-based research. Overall, their initial concern about medication errors in pediatrics was validated by their findings.[25]

Abdalkarem F. Alsharari et al conducted a Cross-sectional study from October 2019 to December 2019 using a descriptive predictive correlational design, self administered questionare were used to see impact of shift rotations on nursing performance and patient safety, they concluded their study by saying that large number of nurses on night shift encountered patient safety issues as well as physiological consequences. They recommended counselling and support sessions for nurses.[26]

Heather A. Wolfe and colleagues conducted a multicenter cohort study in the ICUs of 11 institutions within the CPCCRN network from July 1, 2013, to June 30, 2016. The study aimed to examine the association between the time of day and the quality of CPR, measured by CPR hemodynamics, during pediatric in-hospital CPR. The study concluded that there was no difference in CPR quality between daytime and nighttime.[27]

Yeseli Arias et al. conducted a retrospective cohort study involving admissions to 15 PICUs from May 1995 to December 2001 to investigate the association between the time of admission and the risk of death among children. The study found that patients admitted during evening hours had higher odds of death (OR 1.28; 95% CI 1.65-10.1) compared to those admitted during daytime hours. However, no association was found between mortality rates and the day of admission.[28]

A retrospective study was done by Ali Ertug Arslankoylu et al in PICU of Dogramaci children's hospital from November 2005 to April 2006 analysing 210 consective admissions to see whether any association

between time of admission and rate of mortality. They found no association between timing of admission and mortality rates.[29]

MATERIALS AND METHODS

This prospective observational study was conducted over a period of 15 months (November 2022 to January 2024) in patients admitted to the PICU of a tertiary care centre. This study was carried out in PICU of department of Paediatrics, Dayanand Medical College and Hospital, Ludhiana.

Duration of the study:

Prospective observational study conducted for 15 months from Nov 2022 to Jan 2024.

Inclusion Criteria:

Any critically ill patient (1month-18 years) requiring invasive mechanical ventilation

Duration of stay more than 24 hours

Exclusion Criteria:

Refusal for consent

Patient less than 1 month or more than 18 years

Source of Data:

A prospective observational study was done on critically ill children (1 month- 18 years) requiring mechanical ventilation, admitted to PICU of Dayanand Medical college and hospital.

Methods of Data Collection:

Written informed consent was obtained from parents/guardian after explaining the procedure in his/her vernacular language to allay fear and anxiety. A pre-structured proforma was made and relevant data was entered for comparison of nighttime and daytime management in mechanically ventilated children.

Daytime and nighttime shifts were divided into equal 12 hours period. Daytime shift was defined as duration between 8 am to 7:59 pm and nighttime shift was defined as duration between 8pm to 7:59 am.

During these shifts various parameters were taken into consideration and compared. The parameters studied were as follows[12-14]:

Peak inspiratory pressure (PIP): It reflects the highest pressure recorded during the inspiratory phase of mandatory breaths

Mean airway pressure (MAP): Correlates with the mean alveolar pressure and represents stresses applied to lung parenchyma during ventilation

Fraction of oxygen inspired (FIO2): Amount of oxygen in the inspired gas mixture

SPO2: Also called oxygen saturation, it is the amount of oxygen saturation of hemoglobin in arterial blood

Vasoactive -inotropic score (VIS)[15,16]: It is the quantity of sum of all inotropes and vasoconstrictors administered reflecting pharmacological support to cardiovascular system.

Extubation Failure: Inability to sustain spontaneous breathing after removal of an artificial airway leading to reintubation within 24 to 72 hours.[30]

Extubation failure was attributed to the shift in which the decision to extubate was taken and the process of extubation was carried out.

Diuretic: Any drug that promotes diuresis, leading to increased urination.

All ventilator parameters, fluid boluses and diuretic usage are routinely charted in the nurses progress chart in tabulated manner on an hourly basis. The average of each individual parameter studied was calculated seprately for day and night shifts and entered for each day. The final average for the number of days stayed was calculated and entered on the proforma for each patient. The difference between the parameters studied between the day and night shift was analyzed using appropriate statistical methods.

STATISTICS:

The data were presented using range, mean ± standard deviation (SD), median with interquartile range (IQR), frequencies, and relative frequencies (percentages) as appropriate. Normality of the data distribution was assessed using the Kolmogorov-Smirnov test. Continuous variables were compared between day and night shifts using the Wilcoxon sign rank sum test for non normaly distributed data and paired t test for normally distributed data. Categorical data were analyzed using the Chi-square test and McNemer-Bowker test. Statistical significance was set at a p-value less than 0.05. All statistical analyses were performed using SPSS version 21.0 for Windows (SPSS Inc., Chicago, IL, USA).

OBSERVATIONS AND RESULTS

This prospective observational study was conducted over a period of 15 months (November 2022 to January 2024) in patients admitted to the PICU of a tertiary care centre. A prospective observational study was done on critically ill children (1 month- 18 years) requiring mechanical ventilation.

This study was carried out in PICU of department of Pediatrics, Dayanand Medical College and Hospital, Ludhiana. Total number of patients included were 120. Observation and results are as follows:

TABLE 1: DISTRIBUTION OF PATIENTS ACCORDING TO AGE (n=120)

AGE GROUP	No. of cases	Percentage
< 1 year	36	30.0%
1-5 year	33	27.5%
6-10 year	21	17.5%
> 10 year	30	25.0%
Total	120	100.0%

Maximum number of patients were in less than 1 year group followed by more than 10 years

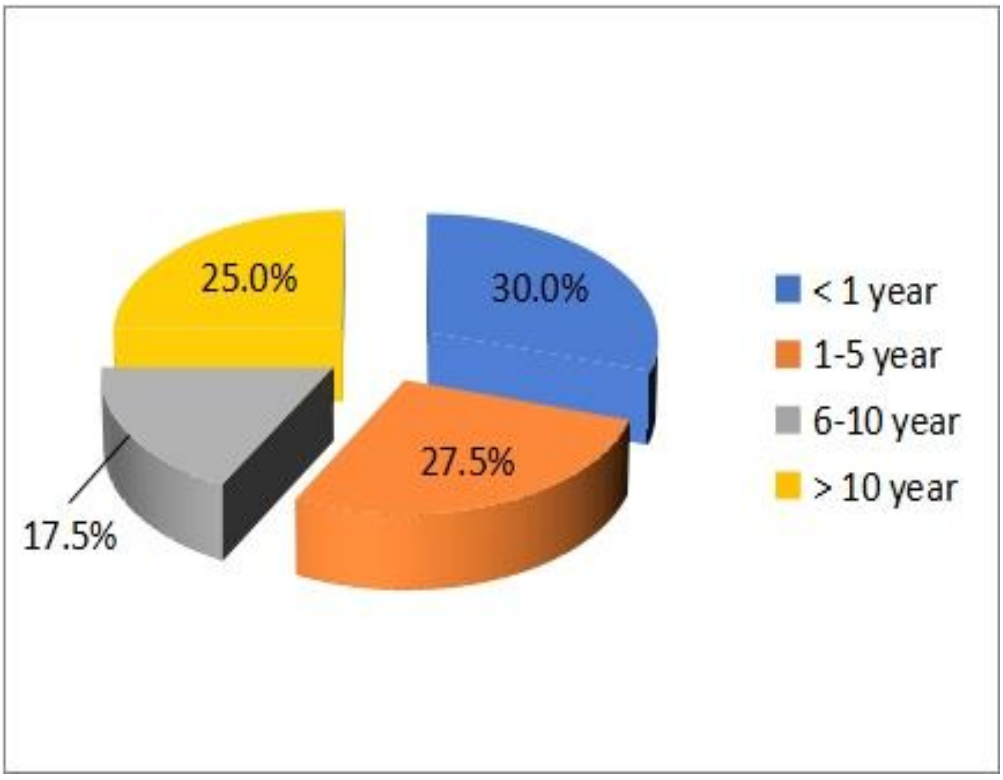

FIGURE 1: DISTRIBUTION OF PATIENTS ACCORDING TO AGE (n=120)

Table 2 – DISTRIBUTION OF PATIENTS ACCORDING TO GENDER (n=120)

Sex	No. of cases	Percentage
F	47	39.2%
M	73	60.8%
Total	120	100.0%

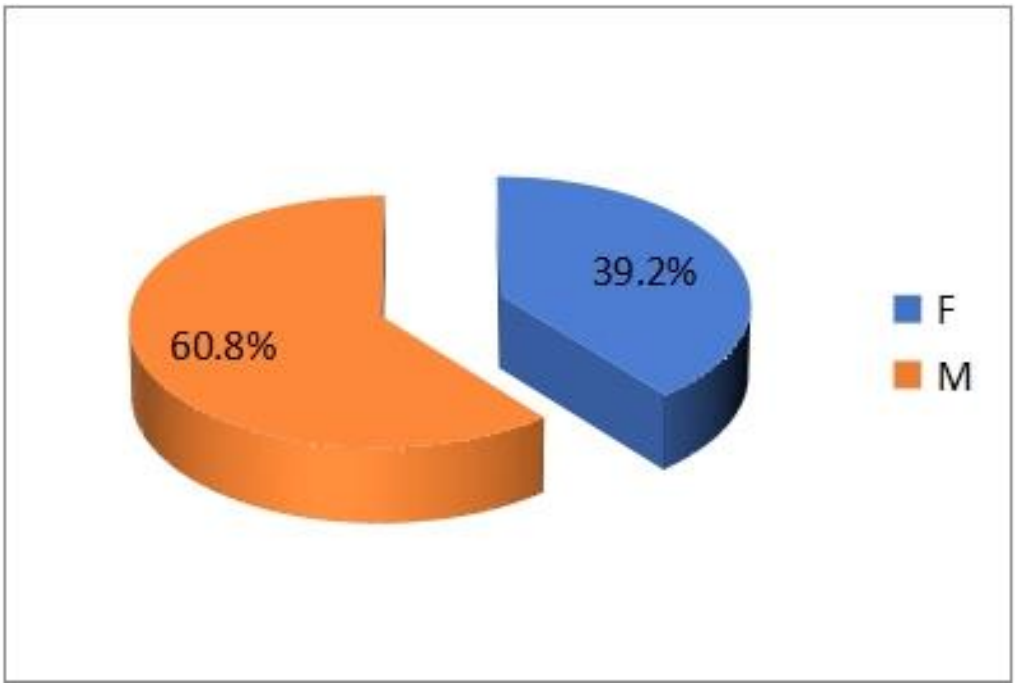

FIGURE 2 – DISTRIBUTION OF PATIENTS ACCORDING TO GENDER (n=120)

TABLE 3: DISTRIBUTION OF PATINETS ACCORDING TO THE SYSTEM INVOLVED

SYSTEM	No. of cases	Percentage
RESPIRATORY	38	31.7%
CENTRAL NERVOUS	25	20.8%
ABDOMEN	24	20.0%
OTHERS	23	19.2%
HEMAT ONCOLOGY	7	5.8%
CVS	5	4.2%

Out of all system involved maximum number were in the respiratory section followed by CNS

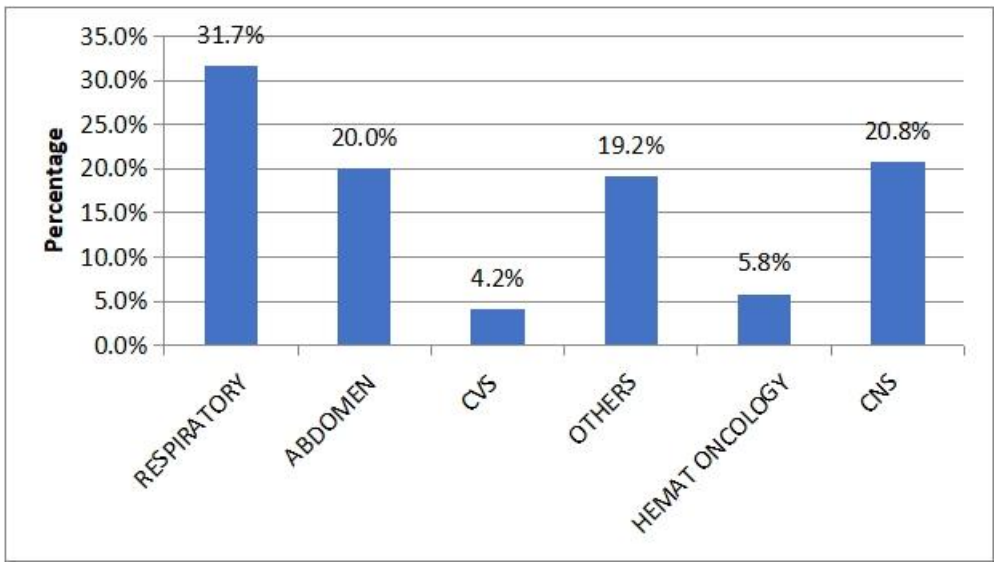

FIGURE 3: DISTRIBUTION OF PATIENTS ACCORDING TO ORGAN SYSTEM INVOLVED

TABLE 4: COMAPRISON OF MEAN PEAK INSPIRATORY PRESSURE (PIP) ACHIEVED DURING DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95 % CONFIDENCE INTERVAL
	Median(IQR)	Median(IQR)		
MEAN PIP (cm H20)	19.85 (17-23.75)	19.35 (17-24)	0.719	-0.15 to 0.19

Mean PIP for day was 20.22 (SD 4.59) while for night was 20.20 (SD 4.93)

No significant difference was found between day and night shift for PIP (p= 0.719)

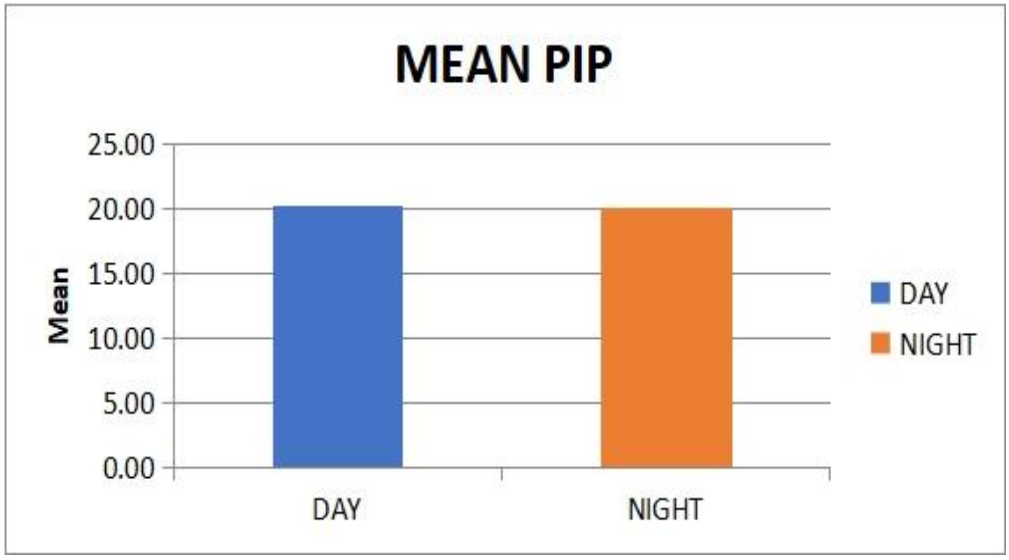

FIGURE 4: MEAN PIP DAY VERSUS NIGHT SHIFT

TABLE 5: COMPARISON OF FRACTION OF INSPIRED OXYGEN (FIO2) DELIVERED BETWEEN DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95 % CONFIDENCE INTERVAL
	Median (IQR)	Median (IQR)		
MEAN FIO2	30 (25-49.87)	31.15 (25-52.52)	**0.004**	-1.95 to -0.56

Mean Fraction of Inspired oxygen (FIO2) for day was 41.52 (SD 23.93) while for night was 42.78 (SD 25.19)

Significant was found between FIO2 delivered between day and night shift (p=0.004)

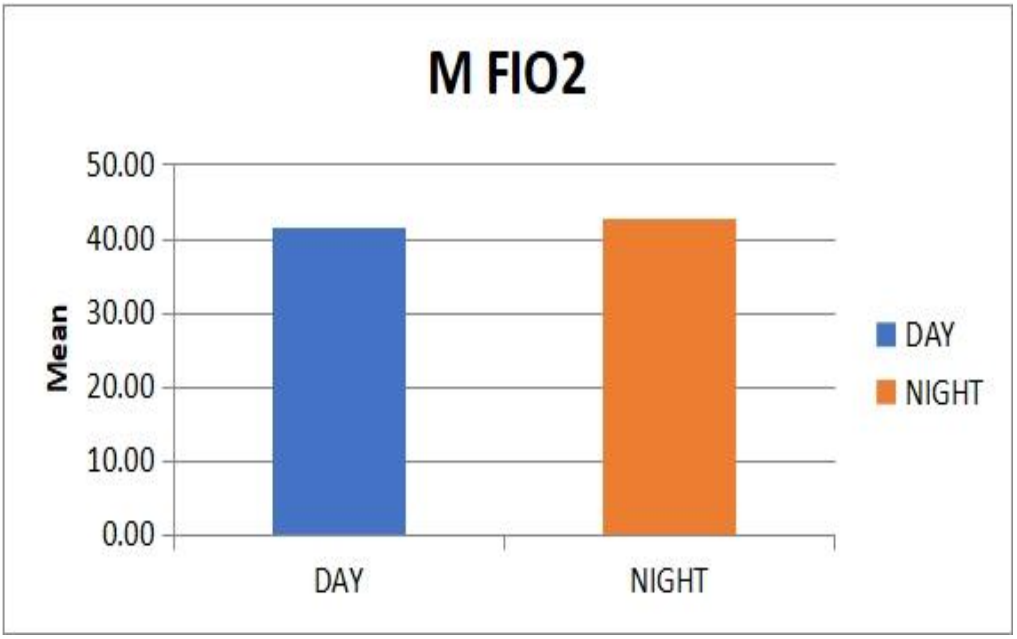

FIGURE 5: MEAN FIO2 DELIVERED BETWEEN DAY AND NIGHT SHIFT

TABLE 6: COMPARISON OF DELIVERY OF MEAN AIRWAY PRESSURE (MAP) BETWEEN DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95% CONFIDENCE INTERVAL
	Median(IQR)	Median(IQR)		
MEAN MAP (cm H2O)	10.8 (9.8-13.27)	10.75 (9.5-14)	**0.022**	-0.40 to -0.03

MEAN AIRWAY PRESURRE (MAP) for day was 11.80 (SD 3.17) while for night was 12.02 (SD 3.49)

Significant difference was found between day and night shift. More pressure were delivered during day shift(p=0.022)

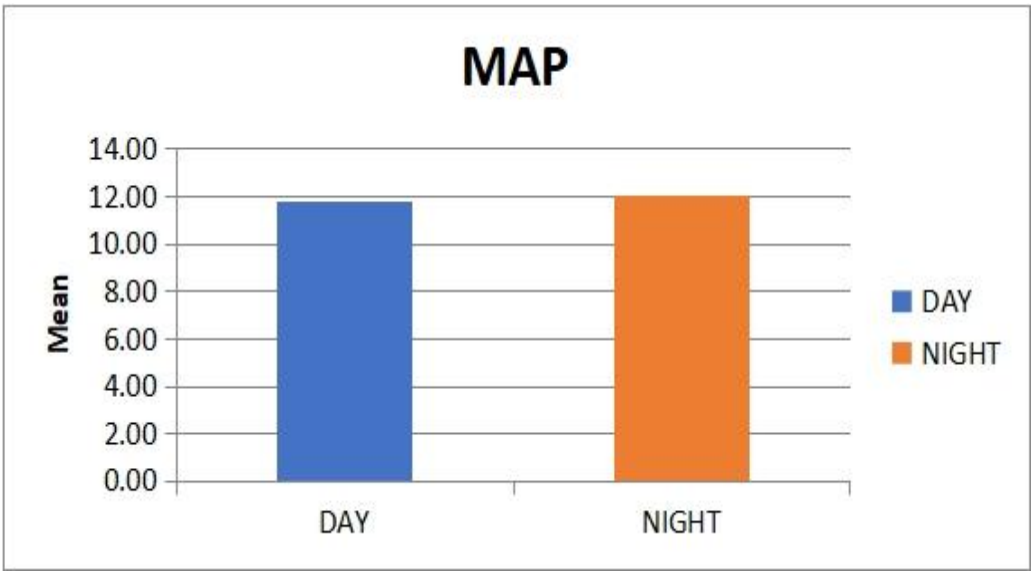

FIGURE 6: COMPARISON OF MAP DELIVERED BETWEEN DAY AND NIGHT SHIFT

TABLE 7: COMPARISON OF MEAN SPO2 ACHIEVED BETWEEN DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95% CONFIDENCE INTERVAL
	Median(IQR)	Median(IQR)		
MEAN SPO2	94.5 (93-95.45)	94.2 (93-95)	**0.001**	0.23 to 0.65

Mean SPO2 for day was 93.79 (SD 2.56) while for night was 93.35 (SD 3.17)

It was found that higher SPO2 could be achieved during day shift (p=0.001)

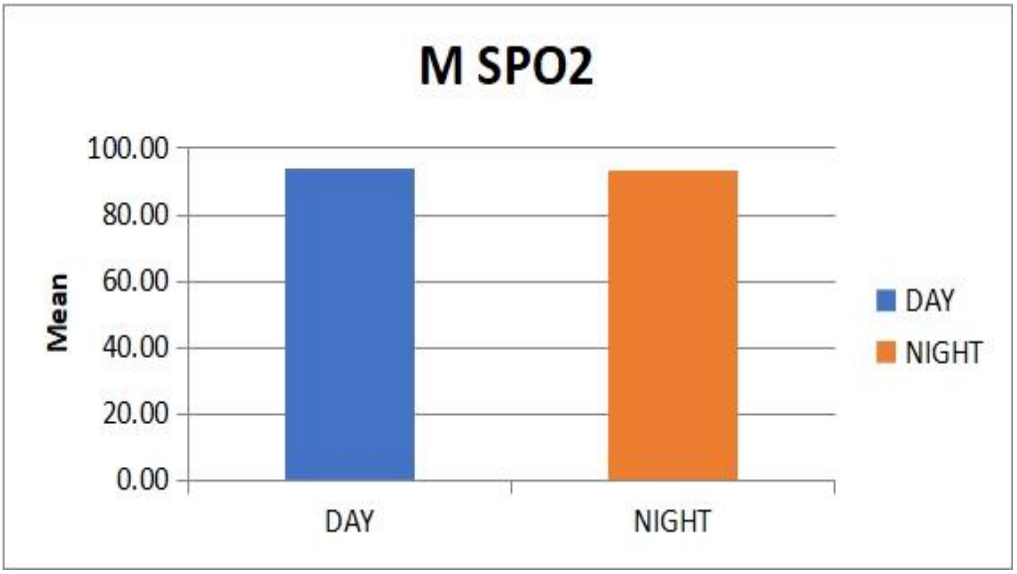

FIGURE 7: COMPARISON OF MEAN SPO2 ACHIEVED BETWEEN DAY AND NIGHT SHIFT

TABLE 8: COMPARISON OF DIURETIC USAGE BETWEEN DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95 % CONFIDENCE INTETVAL
	Median(IQR)	Median(IQR)		
MEAN DIURETIC USAGE (mg/kg)	0 (0-0.2)	0.3 (0.2-0.5)	**0.001**	-0.40 to -0.13

Mean diuretic usage for day was 0.21(SD 0.45) while for night was 0.47 (SD 0.43)

It was found more diuretic was used during the night shift

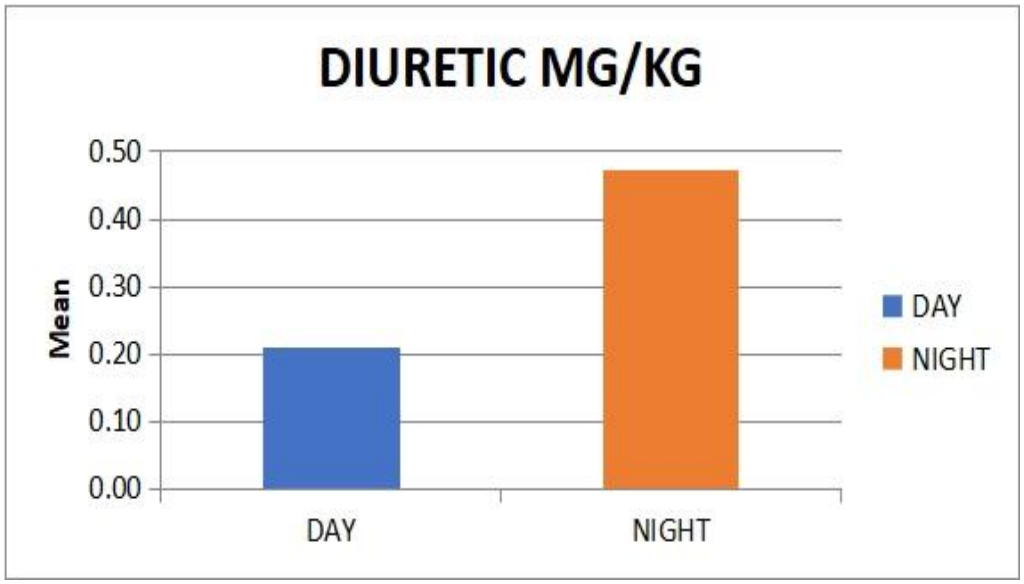

FIGURE 8: COMPARISON OF DIURETIC USAGE BETWEEN DAY AND NIGHT SHIFT

TABLE 9: COMPARISON OF BOLUS GIVEN (ml/kg) BETWEEN TWO SHIFTS

	DAY	NIGHT	p-value	95 % CONFIDENCE INTERVAL
	Median (IQR)	Median (IQR)		
BOLUS GIVEN (ml/kg)	1.4 (1-3.1)	0 (0-1.25)	**0.002**	0.28 to 1.86

Mean bolus given were 2.08 for day while 1.00 for night shift

It was found that more boluses were given during dayshift

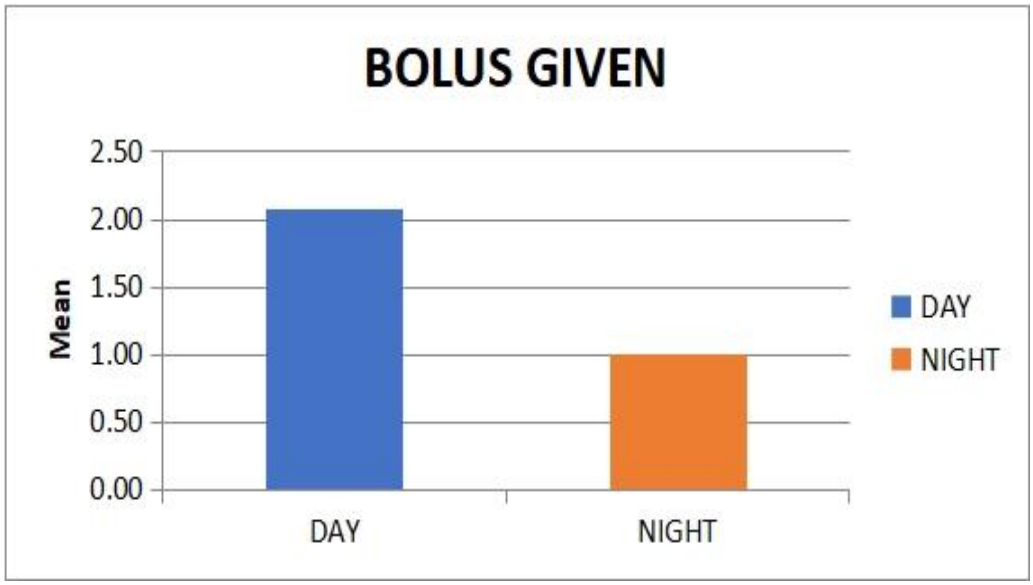

FIGURE 9: COMPARISON OF BOLUS GIVEN (ml/kg) BETWEEN TWO SHIFTS

TABLE 10: COMPARISON OF VASOACTIVE INOTROPE SCORE BETWEEN DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95 % CONFIDENCE INTERVAL
	Median(IQR)	Median(IQR)		
Vasoactive inotropic score (VIS)	79.75 (23.05-131)	100 (37.95-170)	**0.001**	-33.29 to -15.51

Mean VIS for day was 82 (SD 59.38) while for night was 106.39 (SD 69.89)

It was observed that inotropes utilization was statistically significant usage more during night

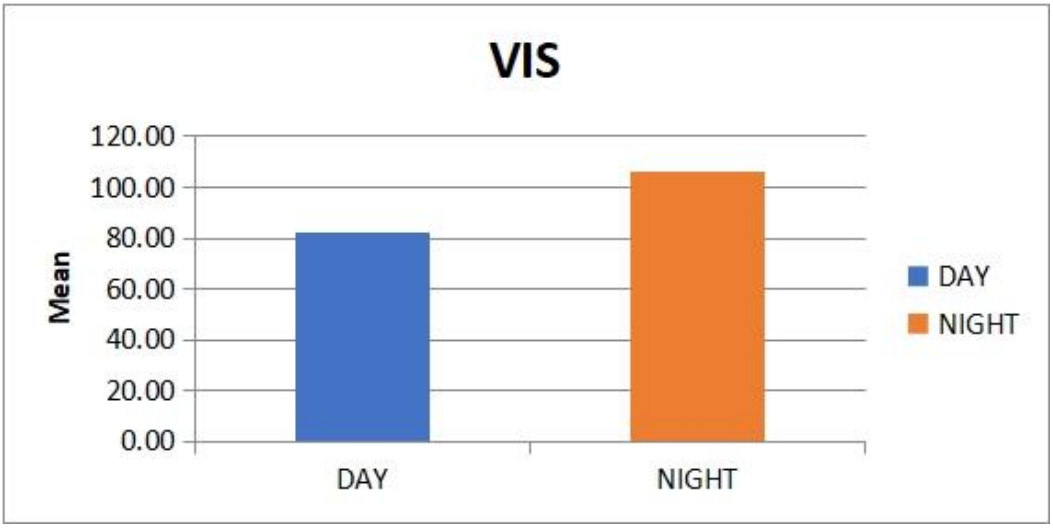

FIGURE 10: COMPARISON OF VASOACTIVE INOTROPIC SCORE BETWEEN DAY AND NIGHT SHIFT

TABLE 11: COMPARISON OF ACCIDENTAL EXTUBATION DAY VERSUS NIGHT SHIFT

		ACCIDENTAL EXTUBATION NIGHT		Total	p-value
		NO n(%)	YES n(%)		
ACCIDENTAL EXTUBATION DAY	NO n(%)	109(90.83)	8(6.66)	117	0.227
	YES n(%)	3(2.5)	0(0)	3	
Total		112	8	120	

Out of total 11 accidental extubations 3 (2.5 %) occurred in day shift 8 (6.66%) occurred during night shift

No significant difference was found between day and night shift of accidental extubation. (p=0.227)

TABLE 12: COMPARISON OF FAILURE OF EXTUBATION PLANNED DURING DAY VERSUS NIGHT SHIFT

		EXTUBATION FAILURE NIGHT		Total	p-value
		NO	YES		
EXTUBATION FAILURE DAY	NO n (%)	114(95)	1(0.83)	115	0.219
	YES n (%)	5(4.16)	0(0)	5	
Total		119	1	120	

Out of total 6 extubation failures 5 (4.16 %) occurred in day shift while 1 (0.83%) occurred during night shift. No significant difference was found between day and night shift of extubation failure

TABLE 13: COMPARISON OF MORTALITY DAY VERSUS NIGHT SHIFT

		MORTALITY NIGHT		Total	p-value
		NO	YES		
MORTALITY DAY	NO n(%)	87(72.5)	20(16.66)	107	0.296
	YES n(%)	13(10.83)	0(0)	13	
Total		100	20	120	

Out of total 33 mortalities 13 (10.83%) occurred in dayshift while 20 (16.66%) occurred during nightshift

No significant difference was found between mortality in day and night shift (p=0.296)

DISCUSSION

The present study was conducted in the PICU of Dayanand medical college and hospital, Ludhiana in critically ill children requiring mechanical ventilation. Our study found statistically significant difference with regard to mean diuretic usage, mean airway pressure ,vasoactive agent usage and FIO2 utilization; night time usage being significantly higher compared to daytime.

Age Distribution:

In the current study, maximum number of children were in age group less than 1 year, n=36 (30%) followed by 1-5 year, n=33 (27.5 %), mean age was 5.8 years. The mean age of study conducted by Parveen Khilani et al [31] was 3.4 years. In a retrospective cohort study done by Graziela et al [32] was The median age was 31 months

Gender Distribution:

In the present study out of 120 patients enrolled, there were 47 (39.2%) females and 73 Males (60.8%).

PRISM Score:

Prism score was taken at time of admission and mean came out to be 13.3. Maximum Prism score was 32 and minimum was 4. In mortality group our median Prism score was 15 for both day and night while patients who were discharged score was 12.

In a retrospective cohort study done by Graziela et al [31] was the median Prism score for patients who died was 15 while for survivors was 7.

Distribution of Patients according to the organ system involved:

Out of all organ system, the maximum number of patients were respiratory 38(31.7%) followed by CNS compromising 24 (20.8%) Abdominal system compromised 24(20 %), Infectious disease 13(10.8%), Hemat-oncology 7(5.8%), CVS 5 (4.2%) and miscellaneous

as 8.3 %.The miscellaneous group constituted drowning, surgical cases etc.

Comparison with other studies:

Jeremy M. Loberger et al. conducted a retrospective cohort study in a 24-bedded tertiary care PICU to compare the outcomes of daytime versus nighttime extubation among 517 mechanically ventilated children. The study found that the extubation failure rate was 10.3% for the day shift and 8.1% for nighttime (p=0.40). Logistic regression analysis at the individual patient level indicated that the shift during which the patient was extubated did not independently predict extubation failure. Based on these findings, the study concluded that the timing of extubation (daytime versus nighttime) was not associated with a higher risk of extubation failure.[19]

Similarly A retrospective cohort study was conducted by Bryan R. Tischenkel at 2 tertiary care academic hospital to compare daytime versus night time extubations in adult ICU. They had taken total 2240 extubations out of which 1555 were extubated during daytime and 685 during nighttime. Of these extubated during day 119(7.7%) got reintubated within 24 hours while 26 (3.8%)got reintubated within 24 hours who were extubated during nighttime. The elihood of getting reintubation was less for nightime than daytime after multi variable adjustment(OR 0.7,95% confidence interval 0.3-0.9,p= 0.01,similar trend was seen for reintubation after 72 hours (OR 0.6,95% CI=0.3-1.0 ,P=0.06).They concluded that nighttime extubation did not have higher likelihood of reintubation[22]

Although in our study more number of extubation failures occurred during day-shift however no statistically significant difference between the day and night shift-time.

Vijai Williams et al. from the Postgraduate Institute of Medical Education and Research, Chandigarh, conducted a systematic review

and meta-analysis to investigate the relationship between the time of admission and mortality rates among critically ill children admitted to PICU. They systematically searched electronic databases such as PubMed, Embase, and others for studies reporting in-hospital mortality and admission times to PICU for patients under 18 years old. Meta-analysis was conducted to analyze the findings.Their systematic review revealed that there was no significant difference in the odds of mortality between admissions during daytime versus nighttime, or between admissions during regular hours versus off-hours..[21]

Similarly, another retrospective cohort study was done in 15 PICUs by Yeseli Arias et al, the study found that patients admitted during evening hours had higher odds of death (OR 1.28);95% CI (1.65-10.1) than those admitted during the daytime hours. It was found that there was no association between mortality rates and day of admission.[27]

Another retrospective study was done by Ali Ertug Arslankoylu et al in PICU of Dogramaci children's hospital from November 2005 to April 2006 analysing 210 consective admissions to see whether any association between time of admission and rate of mortality. They found no association between timing of admission and mortality rates.[28]

However, we compared the occurrence of mortality related to the shift in which death occurred and was not based on association of mortality according to the shift in which admission took place. Although the percentage of morality was higher during night shift, however there was no statistically significant difference in daytime versus nighttime mortality in our study.

It was found in our study that higher spo2 could be achieved during day time despite significantly lesser use of FIO2 which could be because of better usage of ventilatory pressures during the day in preference to using higher FIO2 to achieve spo2 levels. This shows that better

oxygenation was achieved in ventilated children during day time likely due to better planning and implementation of ventilatory strategies rather than excessive use of oxygen, thus avoiding oxygen toxicity and its complications.

The greater use of vasoactive agents and diuretics during night may be due to either over zealous targets for hemodynamic stability and fluid balance compared to day time shift or greater sickness of the patients during night shift.

Even though the percentage of accidental extubation were higher during the day there was no statistically significant difference between day and night shift. This shows that level of vigilance and care of ventilated patient was comparable between day and night shift. The percentage children who died was higher during night but statistically significant.

SUMMARY & CONCLUSION

The study revealed that there was significantly greater utilization of PICU resources like vasoactive agents (inotropes) and diuretics during the night.

With regard to mechanical ventilation, greater utilization of Mean Airway Pressure (MAP) and lesser usage of oxygen was observed during daytime. Ventilated children attained better oxygenation (SPO2) during the day despite lesser delivery of oxygen(Fio2)

Overall, the night shift was marked by more aggressive and overenthusiastic utilization of PICU resources and daytime care appeared to involve a more conservative approach and planning

LIMITATIONS

Since the existing available literature on this subject is very scanty and indirect, we could not make sufficient head to head comparison with other studies.

Larger Sample size with multicentric studies could remove bias related to care of ventilated children

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KEY TO MASTER CHART

M	:	Male
F	:	Female
Sys	:	System
Resp	:	Respiratory
Abd	:	Abdomen
CVS	:	Cardiovascular
Oth	:	Others
MN	:	Mortality Night
MD	:	Mortality Day
DC	:	Discharged
DAMA	:	Discharge against medical advice

S.NO	MRD	age	sex	DOA	complaints	WEIGHT (kg)	SYS RESP	SYS ABD	SYS CVS	OTH	HEMAT ONC	SYS CNS	prov DX
1	1407595	14 Y	M	02/11/2022	FEVER ,COUGH	50	NO	NO	NO	NO	NO	YES	MENINGITIS
2	1408985	9Y	M	04/11/2022	ALTERED SENSORIUM	28	NO	NO	NO	NO	NO	YES	MENINGOENCEPHALITIS
3	1388658	2 M	M	05/11/2022	DIFFICULTY BREATHING	4.5	YES	NO	NO	NO	NO	NO	asPIRATION PNEUMONIA
4	1412302	6Y	F	11/11/2022	FEVER ,VOMITINGS	18	NO	NO	NO	NO	NO	YES	DENGUE
5	1057977	7Y	F	26/12/2022	DYSTONIA	22.5	NO	NO	NO	NO	NO	YES	PKAN
6	1430513	3M	M	04/01/2023	RESPIRATORY DISTRESS,FEVER	4.7	YES	NO	NO	NO	NO	YES	BRONCHOPNEUMONIA
7	1455163	8Y	M	01/02/2023	PAIN ABDOMEN,POOR ORAL INTAKE	19	NO	YES	NO	NO	NO	NO	LIVER ABCESS
8	1455212	3M	M	01/02/2023	LETARGY	5	NO	NO	NO	NO	NO	YES	MENINGOENCEPHALITIS
9	1457284	9Y	F	07/02/2023	SWELLING OF LEFT THIGH	26	NO	NO	NO	YES	NO	NO	SEPTIC ARTHRITIS
10	1458763	2M	F	07/02/2023	LOOSE STOOL	4	NO	YES	NO	NO	NO	NO	ADD
11	1459078	4Y	M	08/02/2023	LOOSE STOOL,ABNORMAL BODY MOVEMENTS	13	NO	YES	NO	NO	NO	NO	ADD
12	1459669	6Y	F	08/02/2023	FEVER,DIFFICULTY BREATHING	21	YES	NO	NO	NO	NO	NO	BRONCHO
13	1461784	11Y	M	11/02/2023	LETARGIC	43	NO	NO	NO	NO	NO	YES	MENINGITIS
14	1463980	16Y	F	15/02/2023	YELLOWISH DISCOLORATION	49	NO	YES	NO	NO	NO	NO	VIRAL HEPATITIS
15	1464658	2Y 6M	F	17/02/2023	VINEGAR INGESTION	12	NO	NO	NO	YES	NO	NO	POISONING
16	1465375	2Y	F	18/02/2023	LOOSE STOOL	12	NO	YES	NO	YES	NO	NO	ADD
17	1471374	1Y 6 M	M	27/02/2023	FEVER,RESPIRATORY DISTRESS	10	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
18	1472771	3Y	M	02/03/2023	A/H/O FOREIGN BODY INGESTION	12	NO	YES	NO	NO	NO	NO	FOREIGN BODY
19	1475017	4Y	M	05/03/2023	FEVER,ABNORMAL BODY MOVEMENT	15	NO	NO	NO	NO	NO	YES	STATUS EPILEPTICUS
20	1487746	9Y	F	23/03/2023	DIFFICULTY BREATHING	31	YES	NO	NO	NO	NO	NO	ARDS
21	1452325	2M	M	15/04/2023	COUGH,LETHARGIC	1.8	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
22	1501588	2Y	M	19/04/2023	FEVER,IRRITABLE	9.3	NO	NO	NO	NO	NO	YES	TUBERCUKAR MENINGITIS
23	1502593	5Y	M	20/04/2023	COUGH,ALTERED SENSORIUM	15	YES	NO	NO	NO	NO	NO	-
24	1470466	3M	M	05/03/2023	FEEVR,HEADACHE	4	YES	NO	NO	NO	NO	NO	BRONCHOPENUMONIA
25	1477664	11 M	M	09/03/2023	COUGH,FEVER	7.5	YES	NO	NO	NO	NO	NO	ACUTE BRONCHOPNEUMONIA
26	1477546	7M	M	10/03/2023	RESPIRATORY DISTRESS,BLUISH DISCOLORATION	9.8	YES	NO	NO	NO	NO	NO	BRONCHOPENUMONIA
27	1480840	4M	M	15/03/2023	COUGH,COLD DIFFICUTY BREATHING	6.7	NO	NO	YES	NO	NO	NO	MYOCARDITIS
28	1481728	8M	M	16/03/2023	FEVER,COUGH	7	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
29	1483094	14Y	M	17/03/2023	FEVER,VOMIT,ALTERED SENSORIUM	52	NO	YES	NO	NO	NO	NO	HEP
30	1505653	4Y9M	M	25/04/2023	FEVER,ABN BODY MOVEMENTS	16	NO	YES	NO	NO	NO	NO	HEP
31	1481728	9M	M	24/04/2023	FEVER,COUGH	7.7	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
32	1466089	2M	M	24/04/2023	POOR FEEDING	1.3	NO	NO	NO	YES	NO	NO	SEPSIS
33	1517100	1.5 M	F	14/05/2023	DIFFICULTY BREATHING	3	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
34	1517851	4Y	F	16/05/2023	A/H/O DRWONING	14	NO	NO	NO	YES	NO	NO	DROWNING
35	1521240	2Y	M	20/05/2023	A/H/O DOMESTIC FALL	11	NO	NO	NO	YES	NO	NO	DOMESTIC FALL
36	1521130	5Y	M	20/05/2023	VOMIT,DRWOSY	17.5	NO	YES	NO	NO	NO	NO	ACUTE HEPATITIS
37	1523089	7M	M	24/05/2023	COUGH,DIFFICULTY BREATHING	7	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
38	1527933	1M	F	01/06/2023	LOOSE STOOL,DIFFICULTY BREATHING	2.8	NO	YES	NO	NO	NO	NO	ADD
39	1528034	4Y 6M	M	05/06/2023	INC PALLOR,VOMIT	18	NO	YES	NO	NO	NO	NO	ACUTE HEMOLYTIC ANEMIA
40	1542428	7Y	F	27/06/2023	FEEVR,DIFFICULTY BREATHING	25	NO	NO	NO	YES	NO	NO	NEPHROTIC
41	1543637	6Y	F	28/06/2023	A/H/O RSA	17	NO	NO	NO	YES	NO	NO	RSA
42	1543738	1Y 2M	F	01/07/2023	NECK SWELLING	10	YES	NO	NO	NO	NO	NO	DIPHTHERIA
43	1545801	9M	M	03/07/2023	COUGH,FDIFFICULTY BREATHING	9	YES	NO	NO	NO	NO	NO	ASPIRATION PNEUMONIA
44	941380	11Y	M	12/07/2023	RESP DISTRESS	30	NO	NO	NO	NO	YES	NO	ALL WITH RF
45	1550675	5Y	F	11/07/2023	ABN BODY MOVEMENTS	18	NO	NO	NO	NO	NO	YES	MENINGOENCEPHALITIS
46	1552021	11M	M	13/07/2023	FEVER ,RESP DIFFICULTY	10	YES	NO	NO	NO	NO	NO	ARDS
47	1582598	2Y 6 M	F	03/09/2023	FEVER,ALTERED SENSORIUM	15	NO	YES	NO	NO	NO	NO	TROPICAL FEVER
48	1582606	12Y	F	05/09/2023	RESP DISTRESS	36	NO	NO	NO	NO	YES	NO	ALL WITH RF
49	1331711	5Y	F	10/09/2023	COUGH,FEVER	15	YES	NO	NO	NO	NO	NO	BRONCHOPENUMONIA
50	1591279	1Y	F	16/09/2023	ABN BODY MOVEMENTS	10	NO	NO	NO	NO	NO	YES	MENINGOENCEPHALITIS
51	1509767	3Y	M	24/09/2023	COUGH,DIFFICULTY BREATHING	12	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
52	1597192	3M	M	27/09/2023	PALLOR,UNCONCIOUSNESS	6.5	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA

S.NO	MRD	PRISM SCORE	MEAN PIP DAY	MEAN PIP NIGHT	MEAN FIO2 DAY	MEAN FIO2 NIGHT	MAP DAY	MAP NIGHT	MEAN SPO2 DAY	MEAN SPO2 NIGHT	DIURETIC MG/ KG DAY	DIURETIC MG/KG NIGHT	Average bolus ml/kg day	Average bolus ml/kg night	DIURETIC MG/KG DAY1	DIURETIC MG/KG NIG1
1	1407595	8	12.5	12	28	26	11	10	94	95	0	0.5	-	-	N	Y
2	1408985	10	14.4	14.5	24.6	25.6	11.4	11.3	93.8	93.6	-	-	-	-	N	N
3	1388658	9	16.5	16	32.5	34.5	11.5	11.3	95.5	96	-	-	-	-	N	N
4	1412302	12	20	19	42	45	14	15	96	94	-	-	2	0	N	N
5	1057977	9	20	19.5	21	23	10	11	97	96	0	0.5	-	-	N	Y
6	1430513	9.1	20.8	21	48	47	13	13.4	90.8	91.12	0.3	1	5	2.5	Y	Y
7	1455163	10	18.8	18.1	30.8	31.4	9.7	9.5	96	96.5	0	0.4	-	-	N	Y
8	1455212	14	15	16	35	40	12	13	95	94	-	-	-	-	N	N
9	1457284	6	13	12.8	30	34.5	11	10.8	94	93	0.5	0	1	0	Y	N
10	1458763	14	16	16.3	50	58	11.3	11.8	93	94	-	-	1	0	N	N
11	1459078	4	12	11.8	25	28	9	9.2	95	96	-	-	-	-	N	N
12	1459669	10	22.3	22	52	49	15	14.7	93.5	93.4	-	-	-	-	N	N
13	1461784	12	15	14	25	25	11	10.5	95	94	0	0.5	1	0	N	Y
14	1463980	8	14.8	14.7	21.6	21.8	8.5	8.4	94.7	95.4	0.1	0.4	-	-	Y	Y
15	1464658	9	14.7	14.4	27.6	27.2	9.4	9.5	93.8	93.8	0	0.6	2	0	N	Y
16	1465375	10	20.8	21	35	34.2	11.6	11.7	93.8	94.2	-	-	-	-	N	N
17	1471374	7	30	30.5	100	100	18	20	90	88	2	0	1	0	Y	N
18	1472771	13	15	14	21	21	8.8	9	93	93.5	-	-	-	-	N	N
19	1475017	13	14.7	15	23	24.3	7.2	7.5	97	97	0	0.1	-	-	N	Y
20	1487746	15	19	18.1	32.5	31.7	13.1	13.2	92.5	92.3	0.2	0.3	2.3	0	Y	Y
21	1452325	9	16.6	17.2	24.6	25.3	9.5	9.3	93.6	94	-	-	-	-	N	N
22	1501588	14	17.6	14.8	24.6	25.5	7.9	7.7	96.3	98.3	0	0.4	-	-	N	Y
23	1502593	10	15.6	15.3	28.3	22.1	7.6	7.6	96.6	97	0.3	0.7	-	-	Y	Y
24	1470466	16	24	23	97	95	16	15	89	88	1	0	2	0	Y	N
25	1477664	9	18.5	17.5	33.7	31	9.7	8.6	94.7	94.8	0	0.3	2.5	0	N	Y
26	1477546	15	20	18	40	35	11	10	94	95	-	-	1	0	N	N
27	1480840	8	19.5	18.5	32.7	31.7	10.5	9.9	96	96	-	-	0	1.4	N	N
28	1481728	11	14.9	13.5	26.7	24.7	8	7.8	96	94.5	0	0.3	-	-	N	Y
29	1483094	9	15.3	15.2	21	22.8	8.2	8.1	96.4	96	0	0.3	-	-	N	Y
30	1505653	8	20	18	28	25	10	9.2	95	94	0	1	-	-	N	Y
31	1481728	10	18.5	17	36.5	30.5	8.5	8.7	96	97	1	1.5	-	-	Y	Y
32	1466089	13	18.8	18.7	41	39.3	10.1	10.5	96.2	94.5	0.2	0.3	0	2.5	Y	Y
33	1517100	22	30	31	100	100	21	21.5	90	87	-	-	0	1	N	N
34	1517851	28	19	19.2	37	36.5	12.4	12.6	95	94	0.1	0.4	-	-	Y	Y
35	1521240	12	18	17.7	25	24.5	9.8	9.3	95	94.7	-	-	-	-	N	N
36	1521130	20	18.8	19.1	40	39.6	12.2	12	94.3	94.6	0	0.7	3.3	0	N	Y
37	1523089	9	19	19	25	24	10	9	95	94	-	-	-	-	N	N
38	1527933	7	15.1	14.6	23.6	23.5	8	7.8	95.6	95.3	-	-	3.3	0	N	N
39	1528034	32	15	15.5	28	35	7	7.5	93	94	2	1.5	0	5	Y	Y
40	1542428	25	29	30	84.3	85	21	22	86	86	1.6	2	7.5	3.3	Y	Y
41	1543637	12	18.6	18.8	23.1	23.5	9.4	8.8	95.3	96.3	0.1	0.6	-	-	Y	Y
42	1543738	10	26	25	50	55	19	20	94	93	-	-	-	-	N	N
43	1545801	9	21	21.5	50	60	16	16.5	93	94.5	0	2	2	1	N	Y
44	941380	15	21	20	30	32	13	14	94	93	-	-	15	1	N	N
45	1550675	15	20	19.6	25.6	24.5	11.2	11.3	96	95	0	0.6	0	3.3	N	Y
46	1552021	16	30	30	100	100	17.5	16.5	88.5	87	0	0.5	5	0	N	Y
47	1582598	12	17	17.1	22.5	22.8	9	9.3	95.5	95	-	-	2.5	1.3	N	N
48	1582606	14	19	20	40	50	10	11	94	93	-	-	1	0	N	N
49	1331711	15	25	26	62.3	66.3	12.6	13.5	92	91.6	-	-	0	3.3	N	N
50	1591279	8	16	15	25	23	9	9.5	96	95	-	-	-	-	N	N
51	1509767	8	21.2	21.9	38.4	37.2	13.2	13.5	94.8	93.8	0.2	0.8	0	2	Y	Y
52	1597192	12	25.5	25	95	95.5	14.5	15	89	88	-	-	5	0	N	N

S.NO	MRD	ACCIDENTAL EXTUBATION DAY	ACCIDENTAL EXTUBATION NIGHT	MORTALITY DAY	MORTALITY NIGHT	VIS DAY	VIS NIGHT	DISCHARGE	DAMA	OUTCOME	EXTUBATION FAIL D	EXTUBATION FAIL NIG
1	1407595	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
2	1408985	NO	YES	NO	NO	30.3	30.6	YES	NO	DC	NO	NO
3	1388658	NO	YES	NO	NO	-	-	YES	NO	DC	NO	NO
4	1412302	NO	NO	NO	YES	0	100	NO	NO	MN	NO	NO
5	1057977	NO	NO	NO	NO	-	-	YES	NO	DC	YES	NO
6	1430513	NO	NO	YES	NO	-	-	NO	NO	MD	NO	NO
7	1455163	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
8	1455212	NO	YES	NO	NO	-	-	NO	YES	DAMA	NO	NO
9	1457284	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
10	1458763	NO	NO	YES	NO	150	190	NO	NO	MD	NO	NO
11	1459078	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
12	1459669	YES	NO	NO	NO	7	5.8	YES	NO	DC	NO	NO
13	1461784	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
14	1463980	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
15	1464658	NO	NO	NO	NO	6	4	YES	NO	DC	NO	NO
16	1465375	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
17	1471374	NO	NO	YES	NO	60	60	NO	NO	MD	NO	NO
18	1472771	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
19	1475017	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
20	1487746	NO	YES	NO	NO	-	-	YES	NO	DC	NO	NO
21	1452325	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
22	1501588	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
23	1502593	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
24	1470466	NO	NO	NO	YES	-	-	NO	NO	MN	NO	NO
25	1477664	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
26	1477546	NO	NO	NO	NO	20	30	NO	YES	DAMA	NO	NO
27	1480840	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
28	1481728	YES	NO	NO	NO	-	-	YES	NO	DC	NO	NO
29	1483094	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
30	1505653	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
31	1481728	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
32	1466089	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
33	1517100	NO	NO	NO	YES	100	150	NO	NO	MN	NO	NO
34	1517851	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
35	1521240	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
36	1521130	NO	NO	NO	NO	76.6	70	NO	YES	DAMA	NO	NO
37	1523089	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
38	1527933	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
39	1528034	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
40	1542428	NO	YES	NO	YES	50	100	NO	NO	MN	NO	NO
41	1543637	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
42	1543738	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
43	1545801	NO	NO	NO	YES	-	-	NO	NO	MN	NO	NO
44	941380	NO	NO	NO	YES	50	100	NO	NO	MN	NO	NO
45	1550675	NO	YES	NO	NO	-	-	NO	YES	DAMA	NO	NO
46	1552021	NO	NO	YES	NO	75	150	NO	NO	MD	YES	NO
47	1582598	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
48	1582606	NO	NO	NO	YES	150	160	NO	NO	MN	NO	NO
49	1331711	NO	NO	YES	NO	40	83.3	NO	NO	MD	NO	NO
50	1591279	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
51	1509767	NO	NO	NO	NO	6	4	YES	NO	DC	NO	NO
52	1597192	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO

S.NO	MRD	age	sex	DOA	complaints	WEIGHT (kg)	SYS RESP	SYS ABD	SYS CVS	OTH	HEMAT ONC	SYS CNS	prov DX
53	1596410	3M	F	26/09/2023	FEVER,EXCESSIVE CRY	5	NO	NO	NO	NO	NO	YES	MENINGOENCEPHALITIS
54	1599252	3Y	F	30/09/2023	FEVER,COUGH	14	NO	YES	NO	NO	NO	NO	TROPICAL FEVER
55	1575462	14Y	M	01/10/2023	ALTERES SENSORIUM	40	NO	NO	NO	NO	NO	YES	ENCEPHALOPATHY
56	1600259	12Y	M	03/10/2023	FEVER,COUGH	39	YES	NO	NO	NO	NO	NO	ARDS
57	1569715	16Y	M	16/10/2023	COUGH,FEVER	30	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
58	1570712	10Y	M	19/09/2023	DIFFICULTY BREATHING	31	YES	NO	NO	NO	NO	NO	GLOTTIC EDEMA
59	1527723	4Y	F	21/10/2023	FEVER,ALTERED SENSORIUM	10	NO	NO	NO	YES	NO	NO	SEPTIC SHOCK
60	1601055	4M	M	04/10/2023	FEVER,LOSS OF CONCIOUSNESS	6	NO	NO	NO	NO	NO	YES	MENINGOENCEPHALITIS
61	1599575	1Y	M	07/10/2023	LETHARGY,ALTERED COMCIOUNSNESS	5.5	NO	NO	NO	NO	NO	YES	TUBERCULAR MENINGITIS
62	1603356	2M	M	07/10/2023	DIFFICULTY BREATHING	5	NO	NO	YES	NO	NO	NO	MYOCARDITIS
63	1606238	3Y	F	12/10/2023	FEVER,ALTERED SENSORIUM	12	NO	NO	NO	NO	NO	YES	MENINGOENCEPHALITIS
64	1491673	3Y 6M	M	12/10/2023	DIFFICULTY BREATHING	10	NO	NO	NO	NO	YES	NO	B-ALL WITH SHOCK
65	1614757	15Y	F	27/10/2023	FEVER,DIFFICULTY BREATHING	44	NO	NO	NO	YES	NO	NO	MODS
66	1615494	1Y 4M	M	30/10/2023	FEVER,DIFFICULTY BREATHING	9	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
67	1615498	8Y	F	16/10/2023	FEVER	21	NO	NO	NO	YES	NO	NO	STAPH SE[SIS
68	1615486	12Y	F	30/10/2023	FEVER,DIFFICULTY BREATHING	36	NO	YES	NO	NO	NO	NO	TROPICAL FEVER
69	1617224	1Y	M	02/11/2023	VOMITING,COUGH	8.5	NO	YES	NO	NO	NO	NO	IEM
70	1631394	13Y	M	01/12/2023	FEVER,DIFFICULTY BREATHING	40	YES	NO	NO	NO	NO	NO	-
71	1617724	2M	F	03/11/2022	FEVER	4.2	YES	NO	NO	NO	NO	NO	SUBCUTANEUS EMPHYSEMA
72	1618970	12Y	M	05/11/2023	BLUISH COLORED PATCHES	39	NO	NO	NO	YES	NO	NO	DENGUE
73	1618946	2Y	M	05/11/2023	ABN BODY MOVEMENTS	10	NO	NO	NO	NO	NO	YES	SEIZURE DISORDER
74	1619929	11Y	M	07/11/2023	FEVER,DIFFICULTY BREATHING	38	NO	NO	NO	YES	NO	NO	SEVERE DENGUE WITH ARDS
75	1620798	1Y10M	M	08/11/2023	FEVER,LOSS OF CONCIOUSNESS	10	NO	NO	YES	NO	NO	NO	MISC
76	1621895	10Y	F	09/11/2023	LOOSE STOOLS,LETARGY	30	NO	YES	NO	NO	NO	NO	ADD WITH AKI
77	1621290	11Y	M	10/11/2023	A/H/O TRAUMA	8.2	NO	NO	NO	YES	NO	NO	INTESTINAL OBSTRUCTION
78	1621759	3M	M	10/11/2023	FEVER,DIFFICULTY BREATHING	5	YES	NO	NO	NO	NO	NO	BRONCHIOLITIS
79	1621290	3Y 6M	F	10/11/2023	FEVER,LOSS OF CONCIOUSNESS	13.5	NO	YES	NO	NO	NO	NO	ADD
80	1622237	10Y	M	14/11/2023	ABN BODY MOVEMENTS	32	NO	NO	NO	YES	NO	NO	DENGUE ENCE[HALITIS
81	45773	9Y3M	M	15/11/2023	FEVER,ALTERED SENSORIUM	32	NO	NO	NO	YES	NO	NO	SEVERE DENGUE
82	1622194	15Y	F	12/11/2023	DIFFICULTY BREATHING	39	NO	NO	NO	NO	YES	NO	B-ALL
83	1630449	3Y	F	29/11/2023	A/H/O FALL	12	NO	NO	NO	YES	NO	NO	FALL FROM HEIGHT
84	1632630	2Y	M	23/11/2023	ALTERED SENSORIUM	10	NO	NO	NO	NO	NO	YES	STROKE
85	1403827	2Y	F	21/11/2023	ALTERED SENSORIUM	9	NO	NO	NO	NO	YES	NO	B-ALL
86	1629793	10Y	M	28/11/2023	FEVER,DIFFICULTY BREATHING	30	YES	NO	NO	NO	NO	NO	LOBAR PNEUMONIA
87	1625515	10Y	M	18/11/2023	FEVER,VOMIT	29.5	NO	NO	NO	NO	NO	YES	MENINGITIS
88	1632588	5Y	M	03/12/2023	A/H/O FALL	19	NO	NO	NO	YES	NO	NO	FALL FROM HEIGHT
89	1633507	12Y	F	05/12/2023	PAIN ABDOMEN,POOR ORAL INTAKE	36	NO	YES	NO	NO	NO	NO	VIRAL HEPATITIS
90	1634384	2Y	F	06/12/2023	A/H/O FALL	11	NO	NO	NO	YES	NO	NO	FALL FROM HEIGHT
91	1634732	5Y	F	7/22/2023	VOMIT,ALTERED SENSORIUM	17	NO	YES	NO	NO	NO	NO	VIRAL HEPATITIS
92	1633439	10Y	F	05/12/2023	FEVER,RASH	30	NO	NO	YES	NO	NO	NO	SLE
93	1636348	1M25D	F	12/12/2023	GREEN VOMIT	4	NO	YES	NO	NO	NO	NO	SAIO
94	1639398	14Y	F	15/12/2023	A/H/O HANGING	45	NO	NO	NO	YES	NO	NO	HANGING
95	1639976	8M	F	17/12/2023	RESP DISTRESS	7	NO	NO	YES	NO	NO	NO	CHD
96	1634496	5M	M	07/12/2023	DIFFICULTY BREATHING	6.2	YES	NO	NO	NO	NO	NO	BRONCHIOLITIS
97	1644997	3Y	M	31/12/2023	FEVER,COUGH	14	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
98	1637283	3Y	M	12/12/2023	FEVER,ALTERED SENSORIUM	13.5	NO	NO	NO	NO	NO	YES	MENINGOENCEPHALITIS
99	1640031	15Y	F	18/12/2023	DIFFICULTY IN WALKING	47	NO	NO	NO	NO	NO	YES	LGBS
100	1646721	7Y	F	01/01/2024	FEVER,DIFFICULTY BREATHING	19	YES	NO	NO	NO	NO	NO	RETROPHARYNGEAL ABCESS
101	1647870	13Y	M	04/01/2024	FEVER,ABDOMINAL DISTENSION	44	NO	YES	NO	NO	NO	NO	SEPTIC ILIETUS
102	1649518	2M	M	08/01/2024	INCREASED RATES OF BREATHING	4.8	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
103	1651602	8M	M	11/01/2024	FEVER,RASH	7	YES	NO	NO	NO	NO	NO	BRONCHOPNEUMONIA
104	1652606	1M 15 D	M	13/01/2024	DIFFICULTY BREATHING	4.8	YES	NO	NO	NO	NO	NO	BRONCHOPEN WITH CHD
105	1652904	10Y	M	13/01/2024	VOMIT,PAIN ABDOMEN	30	NO	NO	NO	YES	NO	NO	SEPSIS

S.NO	MRD	PRISM SCORE	MEAN PIP DAY	MEAN PIP NIGHT	MEAN FIO2 DAY	MEAN FIO2 NIGHT	MAP DAY	MAP NIGHT	MEAN SPO2 DAY	MEAN SPO2 NIGHT	DIURETIC MG/ KG DAY	DIURETIC MG/KG NIGHT	Average bolus ml/kg day	Average bolus ml/kg night	DIURETIC MG/KG DAY1	DIURETIC MG/KG NIG1
53	1596410	11	18.4	18.8	25.6	25.2	10.5	10.3	95	94.5	0.3	0.2	-	-	Y	Y
54	1599252	12	17	17	25.4	25.3	10.5	10.3	96.2	96.5	-	-	2.5	0	N	N
55	1575462	10	24.8	25.5	25.6	28	13.1	13	94.5	94	0	1	3.3	0	N	Y
56	1600259	10	22.8	22.1	30	29.6	12	13.5	96.3	96.5	-	-	-	-	N	N
57	1569715	14	27	25.9	25	26.4	12	12.6	94.8	94.2	0.4	0.2	1.8	0	Y	Y
58	1570712	9	20.5	20	26.5	23.5	9	8.5	96	95.5	-	-	-	-	N	N
59	1527723	16	23	24	100	100	13	14	82	80	-	-	1	0	N	N
60	1601055	12	22	21.3	35	30	13	13.3	94	94.5	0	0.5	-	-	N	Y
61	1599575	15	12.7	11.5	24	24	13.3	13.5	93.5	94.5	-	-	-	-	N	N
62	1603356	16	22	23	61.5	61	11	10.5	94.3	94	-	-	1.3	0	N	N
63	1606238	15	27	28	100	100	14	15	90	88	-	-	1	0	N	N
64	1491673	18	28	28	100	100	16	15.5	90	86	-	-	0	1	N	N
65	1614757	12	15.6	15.5	22.6	23	10.5	10.5	94	94.5	-	-	3.3	0	N	N
66	1615494	15	18.3	18	28	28.2	10.8	10.9	94.6	94.2	0.1	0.3	-	-	Y	Y
67	1615498	12	25.2	25.4	42.2	42.5	15.7	15.8	93.7	93.6	0	0.2	1.1	0	N	Y
68	1615486	14	26.5	26.8	52	54.6	14.6	12	92.4	91.8	-	-	0	2	N	N
69	1617224	14	19.9	20.5	22.8	22.3	10	10	97	96.1	-	-	-	-	N	N
70	1631394	11	22.4	25	60	57.5	14.7	15.4	90.5	91	0.2	0.3	1	0	Y	Y
71	1617724	18	21	21.6	22	25	10.8	10.7	96.8	96.5	-	-	-	-	N	N
72	1618970	17	17.1	17.7	23.6	24.7	10.3	10.4	95.9	95.2	-	-	1.1	1.1	N	N
73	1618946	9	19	19.1	32.8	34.5	10.2	10.4	95.9	94.8	0.2	0.5	1.1	0	Y	Y
74	1619929	15	25	26	50	48	14	15	94	95	-	-	5	0	N	N
75	1620798	18	18	17	24	22	9.3	9.5	94.5	97	0	0.5	2.5	0	N	Y
76	1621895	12	28	29	95	100	16	15	85	82	-	-	5	0	N	N
77	1621290	16	24.8	25.1	30	31	11.8	10.9	93.3	94	0.1	0.5	-	-	Y	Y
78	1621759	18	14	12	30	28	8	8.5	95	94	0.5	0	-	-	Y	N
79	1621290	16	11.5	11.5	27	23.5	8.3	8.5	94.5	94	0	0.3	-	-	N	Y
80	1622237	12	14.3	14	23.1	22.8	10.3	10.3	95.3	95.7	0.1	0	-	-	Y	N
81	45773	16	22	24	100	100	12	13	90	85	-	-	2	1	N	N
82	1622194	22	22	21.3	37.5	38.5	10.8	12.3	96.5	95.5	-	-	0	5	N	N
83	1630449	13	14	13.9	26.5	24.8	10.4	9.5	95.3	94.6	0.1	0.3	-	-	Y	Y
84	1632630	21	24.3	24.5	24.5	24.5	10.5	10.3	97	97	-	-	-	-	N	N
85	1403827	18	29	28	69	75	17	20	92	90	0	0.5	1	0	N	Y
86	1629793	21	25	27	80	90	16	19	90	88	-	-	-	-	N	N
87	1625515	12	19.1	17.6	26.7	27.6	10.4	10.4	94	93.7	0	0.2	1.8	2.7	N	Y
88	1632588	17	18.8	18.3	27.3	26.3	9.6	9.4	94.8	94.8	-	-	-	-	N	N
89	1633507	15	18.7	18.5	24.6	26.6	10	9.7	95	94.7	0	0.3	1.5	0	N	Y
90	1634384	17	25	26	90	100	16	15	90	88	-	-	2	0	N	N
91	1634732	21	19	18	30	25	9	8	94	93	-	-	-	-	N	N
92	1633439	16	16.7	17.3	22.3	24.3	8.5	8.9	96.3	96.1	-	-	3.3	0	N	N
93	1636348	17	18	19.5	21	24	10	9.5	96	95	-	-	-	-	N	N
94	1639398	22	22	21	60	68	13	14	92	94	-	-	2	1	N	N
95	1639976	15	11	11.5	28	30	7	8	96	95	-	-	-	-	N	N
96	1634496	17	21.8	21.1	28.6	30.8	9.8	10.1	94.3	94.7	0	0.1	-	-	N	Y
97	1644997	9	18.5	18.9	23.3	24.8	9.9	10	94.2	94.3	0	0.2	1.1	1.1	N	Y
98	1637283	18	18.8	18.7	26.8	31.5	9.8	9.5	94.6	94.7	-	-	-	-	N	N
99	1640031	7	17	16	26	27	10.5	11	95	94.5	-	-	-	-	N	N
100	1646721	13	32	31.6	100	100	23.5	24.3	88.1	87.1	-	-	3.3	1	N	N
101	1647870	18	14.2	14.3	28.6	27.6	9.5	9.4	95.2	95	0.1	0.2	1.1	0	Y	Y
102	1649518	20	21	20	37.5	38.5	10	10.2	94.8	93.5	0	0.5	-	-	N	Y
103	1651602	14	20.8	20.4	26.6	26.4	10.4	10.6	95.2	95.6	-	-	-	-	N	N
104	1652606	12	18.5	17.8	33.5	30	9.5	9.8	95.5	94.8	-	-	-	-	N	N
105	1652904	21	28	30	95	98	18	17	90	88	-	-	1	0	N	N

S.NO	MRD	ACCIDENTAL EXTUBATION DAY	ACCIDENTAL EXTUBATION NIGHT	MORTALITY DAY	MORTALITY NIGHT	VIS DAY	VIS NIGHT	DISCHARGE	DAMA	OUTCOME	EXTUBATION FAIL D	EXTUBATION FAIL NIG
53	1596410	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
54	1599252	NO	NO	YES	NO	20.6	18	NO	NO	MD	NO	NO
55	1575462	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
56	1600259	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
57	1569715	NO	NO	NO	YES	50	80	NO	NO	MN	NO	NO
58	1570712	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
59	1527723	NO	NO	NO	YES	92	98	NO	NO	MN	NO	NO
60	1601055	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
61	1599575	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
62	1603356	NO	NO	NO	NO	70	66.5	NO	YES	DAMA	NO	NO
63	1606238	NO	NO	YES	NO	140	200	NO	NO	MD	NO	NO
64	1491673	NO	NO	NO	YES	160	200	NO	NO	MN	NO	NO
65	1614757	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
66	1615494	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
67	1615498	NO	YES	YES	NO	17.5	17.6	NO	NO	MD	NO	NO
68	1615486	NO	NO	NO	YES	86	86	NO	NO	MN	NO	NO
69	1617224	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
70	1631394	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
71	1617724	NO	NO	NO	NO	-	-	YES	NO	DC	YES	NO
72	1618970	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
73	1618946	NO	NO	NO	NO	3.3	4.4	YES	NO	DC	NO	YES
74	1619929	NO	NO	NO	NO	110	140	NO	YES	DAMA	NO	NO
75	1620798	NO	NO	YES	NO	79.5	75	NO	NO	MD	NO	NO
76	1621895	NO	NO	NO	YES	201	205	NO	NO	MN	NO	NO
77	1621290	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
78	1621759	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
79	1621290	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
80	1622237	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
81	45773	NO	NO	YES	NO	200	200	NO	NO	MD	NO	NO
82	1622194	NO	NO	NO	NO	5	10	NO	YES	DAMA	NO	NO
83	1630449	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
84	1632630	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
85	1403827	NO	NO	YES	NO	60	110	NO	NO	MD	NO	NO
86	1629793	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
87	1625515	NO	NO	NO	NO	3.6	4	YES	NO	DC	NO	NO
88	1632588	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
89	1633507	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
90	1634384	NO	NO	YES	NO	150	200	NO	NO	MD	NO	NO
91	1634732	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
92	1633439	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
93	1636348	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
94	1639398	NO	NO	NO	YES	200	200	NO	NO	MN	NO	NO
95	1639976	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
96	1634496	NO	YES	NO	NO	-	-	YES	NO	DC	NO	NO
97	1644997	NO	NO	NO	NO	3.3	3.3	YES	NO	DC	NO	NO
98	1637283	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
99	1640031	YES	NO	NO	NO	-	-	YES	NO	DC	NO	NO
100	1646721	NO	NO	NO	YES	153	170	NO	NO	MN	NO	NO
101	1647870	NO	NO	NO	NO	86.7	83.3	YES	NO	DC	NO	NO
102	1649518	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
103	1651602	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
104	1652606	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
105	1652904	NO	NO	NO	YES	150	200	NO	NO	MN	NO	NO

S.NO	MRD	age	sex	DOA	complaints	WEIGHT (kg)	SYS RESP	SYS ABD	SYS CVS	OTH	HEMAT ONC	SYS CNS	prov DX
106	1657590	6M	F	23/01/2024	FEVER,DIFFICULTY BREATHING	21	YES	NO	NO	NO	NO	NO	BRONCHOPEUMONIA
107	1656904	13Y	F	25/01/2024	FEVER,DIFFICULTY BREATHING	41	YES	NO	NO	NO	NO	NO	ARDS WITH MYOCARIDITUS
108	1240583	17Y	F	11/12/2023	ABN BODY MOVEMENTS	45	NO	NO	NO	NO	YES	NO	T-ALL
109	1562555	13Y	F	01/08/2023	FEVER,COUGH	40	YES	NO	NO	NO	NO	NO	ARDS WITH MYOCARIDITUS
110	1054112	8M	M	02/08/2023	ABDOMINAL DISTENSION	7	NO	NO	NO	YES	NO	NO	CELLULITIS
111	1435288	9Y	M	15/12/2022	VOMITING,COUGH	27	NO	YES	NO	NO	NO	NO	VIRAL HEPATITIS
112	1433796	12Y	M	18/12/2022	HEADACHE,FEVER,ALTEREDS ENSORIUM	39	NO	NO	NO	NO	NO	YES	ENCEPHALITIS
113	1433103	11Y	M	16/12/2022	HEADACHE,VOMITING	35.5	NO	NO	NO	NO	NO	YES	ENCEPHALITIS
114	1421908	11Y	M	28/11/2022	ALTERED SENSORIUM	32	NO	NO	NO	NO	NO	YES	ENCEPHALOPATHY
115	632509	15Y	M	20/12/20222	FEVER,COUGH	48	NO	NO	NO	NO	YES	NO	B-ALL WITH BRONCHOPNEUMONIA WITH MYOCARDITID
116	1427918	14Y	F	7/12/20222	FEVER,VOMI	42	NO	NO	NO	YES	NO	NO	DKA
117	1428538	13Y	M	09/12/2022	FEVER,DIFFICULTY BREATHING	47	YES	NO	NO	NO	NO	NO	-
118	1435529	9Y	M	21/12/2022	FEVER,ALTERED SENSORIUM	28	NO	NO	NO	NO	NO	YES	MENINGOENCEPHALITIS
119	1432077	2M	M	15/12/2022	FEVER,DIFFICULTY BREATHING	4.5	NO	YES	NO	NO	NO	NO	ACUTE BRONCHOPNEUMONIA
120	1429019	11Y	M	09/12/2022	LOOSE STOOL,VOMIT	33	NO	YES	NO	NO	NO	NO	ACUTE GASTROENETERITIS

S.NO	MRD	PRISM SCORE	MEAN PIP DAY	MEAN PIP NIGHT	MEAN FIO2 DAY	MEAN FIO2 NIGHT	MAP DAY	MAP NIGHT	MEAN SPO2 DAY	MEAN SPO2 NIGHT	DIURETIC MG/ KG DAY	DIURETIC MG/KG NIGHT	Average bolus ml/kg day	Average bolus ml/kg night	DIURETIC MG/KG DAY1	DIURETIC MG/KG NIG1
106	1657590	21	23.5	24.5	47	50.5	15.3	15	95.5	94.5	-	-	0	5	N	N
107	1656904	18	15.8	17.8	24.4	25.1	10.7	17.9	94.5	94.8	-	-	1.3	0	N	N
108	1240583	18	21.3	21.8	27.9	24	10.6	9.8	93	93.5	0.2	0.3	-	-	Y	Y
109	1562555	17	24	25	88	99	18	19.5	90	88	-	-	1	0	N	N
110	1054112	14	21.5	20.8	30	31.3	9.8	9.8	94.5	95.3	0	0.3	-	-	N	Y
111	1435288	11	22.5	22.6	23.6	23.8	9.8	9.8	94.4	95.6	-	-	-	-	N	N
112	1433796	18	20.8	20.6	36.8	37.3	9.9	10.3	94.5	95.4	0	0.3	0	5	N	Y
113	1433103	12	21.5	22.1	45.3	53.2	13.6	13.8	94.7	93.2	0	0.2	0	8.3	N	Y
114	1421908	15	24	24	33.5	41.8	17.5	17.8	93.5	91.5	0	0.2	5	0	N	Y
115	632509	18	24	25	60	68	16	17	93	92	-	-	-	-	N	N
116	1427918	18	19.8	20.3	34.3	35.3	10.8	11	95	94.5	0	0.3	3.3	0	N	Y
117	1428538	20	28	28.5	51.7	62	15.7	17.1	92	92	-	-	3.3	0	N	N
118	1435529	15	24.3	25.1	49.5	62	11.2	11.7	92.5	91.3	-	-	2.5	2.5	N	N
119	1432077	18	17.1	17.5	36.1	39	9.7	9.7	93.1	92.8	-	-	-	-	N	N
120	1429019	9	28	30	74	88	14.5	15.4	91	89	0	0.3	-	-	N	Y

S.NO	MRD	ACCIDENTAL EXTUBATION DAY	ACCIDENTAL EXTUBATION NIGHT	MORTALITY DAY	MORTALITY NIGHT	VIS DAY	VIS NIGHT	DISCHARGE	DAMA	OUTCOME	EXTUBATION FAIL D	EXTUBATION FAIL NIG
106	1657590	NO	NO	NO	YES	90	190	NO	NO	MN	NO	NO
107	1656904	NO	NO	NO	NO	-	-	NO	YES	DAMA	YES	NO
108	1240583	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
109	1562555	NO	NO	YES	NO	100	180	NO	NO	MD	NO	NO
110	1054112	NO	NO	NO	NO	-	-	YES	NO	DC	YES	NO
111	1435288	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
112	1433796	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
113	1433103	NO	NO	NO	NO	133	160	NO	YES	DAMA	NO	NO
114	1421908	NO	NO	NO	YES	125	170	NO	NO	MN	NO	NO
115	632509	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
116	1427918	NO	NO	NO	NO	-	-	YES	NO	DC	NO	NO
117	1428538	NO	NO	NO	YES	80	110	NO	NO	MN	NO	NO
118	1435529	NO	NO	NO	YES	97.5	112.5	NO	NO	MN	NO	NO
119	1432077	NO	NO	NO	NO	-	-	NO	YES	DAMA	NO	NO
120	1429019	NO	NO	NO	YES	120	150	NO	NO	MN	NO	NO

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Subject:: Approval of Plan of Thesis.

This is to inform you that the Faculty of Medical Sciences in its meeting held on 25.09.2023 has approved the plan of thesis of **Mayank Khullar**, a student of your college for **MD Paediatrics** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
Comparison of daytime versus night time management in mechanically ventilated children .

Supervisor
Dr. Siddharth Bhargava
Assoc. Prof.,
Dept. of Paediatrics

Co-Supervisor:-
Dr. Puneet A. Pooni
Prof. & Head
Dept. of Paediatrics

The student may submit the thesis in triplicate alongwith the plan in triplicate also, to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She may be directed to attach a photocopy of this letter with the forwarding letter while submitting thesis in the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic, if any.

Controller of Examinations

Note :

1. *If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.*

INTRODUCTION

The need for mechanical ventilation is the most common indication for children admitted to intensive care unit [1-3]. Approximately 50 percent children admitted to pediatric ICU require mechanical ventilation[4]. Mechanical ventilation represents a cornerstone intervention in the management of critically ill children, providing vital respiratory support to those unable to sustain adequate oxygenation or ventilation independently. The management of mechanically ventilated children demands precision, vigilance, and adaptability.

Within the PICU, the care of mechanically ventilated children is characterized by a multifaceted approach encompassing ventilator management, hemodynamic support, fluid and electrolyte management, sedation and analgesia, and prevention of complications such as ventilator-associated pneumonia and accidental extubation, thus extending beyond mere respiratory support to encompass the optimization of various parameters crucial for patient stability and recovery.

In the continuum of pediatric critical care, the management of mechanically ventilated children unfolds across different shifts, each characterized by its unique challenges, dynamics, and clinical priorities. Daytime care is often marked by heightened activity, multidisciplinary rounds, frequent planning and interventions. In contrast nighttime care presents its own set of complexities, including reduced staffing levels, altered patient physiology, and the potential for sleep disturbances resulting in reduced attention span and cognitive ability of health care professionals.

The outcome of a patient in an ICU generally depends upon multiple factors, including the severity of the illness, the nature of the disease, its reversibility and the quality of healthcare delivered. Further, the quality of healthcare delivery depends upon various factors which affect the performance of healthcare providers. Past and recent

literature indicates that the cognitive performance of ICU physicians and nurses tends to decline for various reasons during night time shifts[5-7].

In addition, it is a general observation that ICU resources including oxygen and pressure delivery through mechanical ventilation, vasoactive agents, diuretics etc tend to be overused during night time shifts with the concern of maintaining vital functions and ensuring patient survival. ‘The more, the better’ seems to be the general notion amongst resident doctors with regard to the utilization of these resources. The difference may stem from the fact that day time is the usual time when more active planning and decision making takes place in the ICU. Hence, resource utilization is expected to be more judicious during this period. This over-utilization may help to achieve certain short term gains, but can result in potentially harmful the long term consequences like oxygen toxicity[8], ventilator induced lung injury or inappropriate management of shock.

The optimization of resource utilization is a central tenet of modern healthcare delivery, driven by the inputs to deliver high-quality care while ensuring cost-effective allocation of resources.[9] In the context of pediatric critical care, the judicious use of resources is paramount, given the vulnerable nature of the patient population and the finite availability of healthcare resources. Understanding how management practices vary between day and night shifts is crucial for optimizing resource allocation, enhancing patient outcomes, and improving the overall efficiency of care delivery in the PICU.

This thesis seeks to address this gap by conducting a comprehensive comparison of daytime versus nighttime management in mechanically ventilated children, focusing on parameters such as delivery of ventilatory pressure, FiO2 delivered, fluid bolus administration, diuretic usage, mortality rates, extent of vasoactive agents utilisation, and the incidence of accidental extubation.

The findings of this study hold significant implications for clinical practice, healthcare policy, and future research endeavors in pediatric critical care. By elucidating the differences in management practices and outcomes between day and night shifts, this research aims to inform clinical decision-making, optimize resource allocation strategies, and ultimately improve patient outcomes in the PICU.

Understanding the nuances of care provision during different shifts is essential for optimizing patient outcomes, enhancing resource utilization, and mitigating risks associated with critical illness. There has been increasing interest in factors determining the quality of care provided in PICU during night, holiday or weekends

It is important to know how management practices vary between day and night shifts is crucial for tailoring care delivery to the unique needs and challenges of each time period. By identifying areas of disparity and opportunities for improvement, this research has the potential to enhance the quality, safety, and efficiency of care provision in pediatric critical care settings, ultimately benefiting mechanically ventilated children and their families.

In order to investigate these facts, we plan to audit and analyze if any significant differences exist with regard to the delivery of healthcare and resource utilization between day and night shifts in Pediatric ICU.

Despite the critical importance of efficient resource utilization in pediatric critical care, there remains a paucity of literature specifically examining the comparative dynamics of daytime versus nighttime management in mechanically ventilated children. While individual studies have explored various aspects of care provision during different shifts, there is a need for comprehensive analyses that encompass a wide range of parameters and outcome.

This study explores the comparative dynamics of daytime versus nighttime management in mechanically ventilated children, focusing on a spectrum of parameters critical for patient care and resource

utilization. The parameters under investigation encompass key facets of ventilator management, fluid and medication administration, patient monitoring, and clinical outcomes. By systematically examining the differences in management practices and outcomes between day and night shifts, this research aims to elucidate the impact of shift-related variations on patient care and resource utilization in the PICU and act as an audit,while providing opportunities for further improvement.

In summary, this thesis represents a critical step towards optimizing resource utilization and improving outcomes in mechanically ventilated children, with goal of ensuring the provision of high-quality care across all shifts in the PICU.

AIMS AND OBJECTIVES

1) To compare the difference in utilization of intensive care resources including level of respiratory support, vasoactive infusions and other such modalities in pediatric ICU between day and night shift.
2) To Compare the differences in indicators of pediatric ICU care and outcomes including accidental extubation, extubation failure and incidence of mortality between day and night shift.

REVEIW OF LITERATURE

Mechanical ventilation is used to maintain adequate lung function in critically ill patients. The benefits and harms of ventilator not only depend on operators setting of machine but also on ventilator derived parameters[10-11].

Various terms associated with ventilator has been described in literature[12-14]

Peak inspiratory pressure (PIP): It is the maximum pressure recorded during the inhalational phase of mandatory breaths.

Mean airway pressure (MAP): Corresponds to the mean alveolar pressure and represents the stress applied to lung parenchyma during ventilation.

Fraction Of Inspired Oxygen: Amount of oxygen in the inspired gas mixture.

SPO2: Also called oxygen saturation, it is the amount of oxygen saturation of hemoglobin in arterial blood

Vasoactive -inotropic score[15-16]: It is the quantity of sum of all inotropes and vasoconstrictors administered reflecting pharmacological support to cardiovascular system.

Numerous studies have investigated the differences in resource utilization and outcomes between daytime and nighttime care in pediatric ICUs. The medical literature indicates that acutely ill patients receiving care during nighttime or weekend hours often experience poorer outcomes compared to those treated during daytime hours.

Previous research has highlighted notable variations in mortality risk due to several factors. These include a higher number of at-risk patients during weekends or evening hours, differences in how and when patients seek medical care, socioeconomic status, and lifestyle choices.

There is another major difference in care during day & night in intensive care units, for in stance, most of the investigations like chest x rays, blood tests, weight-height measurement, etc are done in the morning time while use of analgesics, sedatives, diuretics etc is more in the night shift so that patient is able to sleep peacefully throughout the night and receive adequate rest.

Literature Review: Comparison of Daytime vs. Nighttime Management in Mechanically Ventilated Children

A retrospective study by Eric D. Hixson and colleagues aimed to determine the impact of weekend or evening admissions on mortality in a pediatric intensive care unit (PICU) staffed 24/7 by board-certified pediatric intensivists. The study included children admitted to the PICU from August 1996 to December 2003, ranging in age from 0 days to 21 years. The researchers found that crude mortality rates were significantly higher during weekends and evenings. However, after conducting multivariate logistic regression analysis, they concluded that weekend admissions, weekend discharges/deaths, and evening admissions did not have a significant independent effect on mortality risk, either for the entire sample or for the subset of emergency patients.[17]

Another study by Hannah Wunsch et al., conducted from 1995 to 2000 in 102 adult ICUs across England, Wales, and Northern Ireland, aimed to investigate whether hospital mortality was linked to the day of the week or the time of admission to intensive care units (ICUs). The researchers concluded that there were no significant differences in hospital mortality based on the day of the week or the time of day when patients were admitted to the ICU.[18]

Jeremy M. Loberger et al. conducted a retrospective cohort study in a 24-bed tertiary care Pediatric Intensive Care Unit (PICU) to compare extubation outcomes between daytime and nighttime shifts. The study included 517 mechanically ventilated children. The extubation failure

rate was 10.3% for the daytime shift and 8.1% for the nighttime shift (p = 0.40). Logistic regression analysis at the individual subject level indicated that the timing of extubation (day vs. night) was not associated with extubation failure. They concluded that extubation failure was not independently related to the shift during which the child was extubated.[19]

Jeremy M. Loberger et al. conducted a prospective longitudinal cohort study at the Children's of Alabama Pediatric Intensive Care Unit (PICU) to investigate potential differences in the administration of analgesic and sedation medications to mechanically ventilated children between daytime and nighttime. A secondary objective was to evaluate nursing attitudes and practices regarding the administration of these medications. The study concluded that there was no significant diurnal variation in the amount of analgesic and sedation medications administered to mechanically ventilated patients in the PICU.[20]

Vijai Williams, Nishant Jaiswal, and colleagues conducted a study at PGI to examine the relationship between the time of admission and mortality among children admitted to a pediatric intensive care unit (PICU). The study included observational data on in-hospital mortality and admission times for patients under 18 years of age. They found that weekday admissions to the PICU were associated with lower odds of mortality. No significant differences in mortality odds were observed between day versus night admissions or regular hours versus off-hours admissions. However, they noted that the evidence was of low quality and recommended larger prospective studies for more definitive conclusions.[21]

A retrospective cohort study was conducted by Bryan R. Tischenkel at 2 tertiary care academic hospital to compare daytime versus night time extubations in adult ICU. They had taken total 2240 extubations out of which 1555 were extubated during daytime and 685 during nighttime. Of these extubated during day 119 (7.7%) got reintubated within 24 hours while 26 (3.8%) got reintubated within 24 hours who were

extubated during nighttime. The likelihood of getting reintubation was less for nightime than daytime after multi variable adjustment (OR 0.7, 95% confidence interval 0.3-0.9,p= 0.01,similar trend was seen for reintubation after 72 hours (OR 0.6,95% CI=0.3-1.0 ,P=0.06).They concluded that nighttime extubation did not have higher likelihood of reintubation.[22]

Francois maltese et al conducted a prospective observational comparative, randomized cross over study with objective to study of effect of night shift on cognitive performance of ICU physicians in France .The study concluded that the cognitive abilities of intensive care physicians were significantly impaired after a night shift in the ICU, irrespective of their professional experience or the amount of sleep they had during the shift.[23]

April D. Miller et al. carried out a retrospective study in 2008 to analyze medication error rates over a one-year period, comparing daytime versus nighttime shifts and weekdays versus weekends in a children's hospital. They reviewed 140 reported errors from January to December 2008, classifying them by type and severity based on established standards. Two investigators independently classified the errors, with a third investigator specializing in pediatric pharmacy resolving any discrepancies. Pharmacy records provided data on doses dispensed. The study found that medication error rates were higher during evening and nighttime shifts compared to daytime shifts and higher during weekends compared to weekdays.[24]

Maisoon Abdullah Ghaleb, Nick Barber, and colleagues conducted a study to systematically locate and review research on the incidence of medication errors in pediatric inpatients and to identify common errors. They performed a systematic search of databases for studies related to medication errors in children. The review found that dosing errors were the most common type of medication error, often involving doses that were ten times higher than required. Antibiotics and sedatives were the drug classes most frequently associated with these errors. The

interpretation of the literature was complicated by variations in definitions, research methods, and settings used by different studies, as well as a lack of theory-based research. Overall, their initial concern about medication errors in pediatrics was validated by their findings.[25]

Abdalkarem F. Alsharari et al conducted a Cross-sectional study from October 2019 to December 2019 using a descriptive predictive correlational design, self administered questionare were used to see impact of shift rotations on nursing performance and patient safety, they concluded their study by saying that large number of nurses on night shift encountered patient safety issues as well as physiological consequences. They recommended counselling and support sessions for nurses.[26]

Heather A. Wolfe and colleagues conducted a multicenter cohort study in the ICUs of 11 institutions within the CPCCRN network from July 1, 2013, to June 30, 2016. The study aimed to examine the association between the time of day and the quality of CPR, measured by CPR hemodynamics, during pediatric in-hospital CPR. The study concluded that there was no difference in CPR quality between daytime and nighttime.[27]

Yeseli Arias et al. conducted a retrospective cohort study involving admissions to 15 PICUs from May 1995 to December 2001 to investigate the association between the time of admission and the risk of death among children. The study found that patients admitted during evening hours had higher odds of death (OR 1.28; 95% CI 1.65-10.1) compared to those admitted during daytime hours. However, no association was found between mortality rates and the day of admission.[28]

A retrospective study was done by Ali Ertug Arslankoylu et al in PICU of Dogramaci children's hospital from November 2005 to April 2006 analysing 210 consective admissions to see whether any association

between time of admission and rate of mortality. They found no association between timing of admission and mortality rates.[29]

MATERIALS AND METHODS

This prospective observational study was conducted over a period of 15 months (November 2022 to January 2024) in patients admitted to the PICU of a tertiary care centre. This study was carried out in PICU of department of Paediatrics, Dayanand Medical College and Hospital, Ludhiana.

Duration of the study:

Prospective observational study conducted for 15 months from Nov 2022 to Jan 2024.

Inclusion Criteria:

Any critically ill patient (1month-18 years) requiring invasive mechanical ventilation

Duration of stay more than 24 hours

Exclusion Criteria:

Refusal for consent

Patient less than 1 month or more than 18 years

Source of Data:

A prospective observational study was done on critically ill children (1 month- 18 years) requiring mechanical ventilation, admitted to PICU of Dayanand Medical college and hospital.

Methods of Data Collection:

Written informed consent was obtained from parents/guardian after explaining the procedure in his/her vernacular language to allay fear and anxiety. A pre-structured proforma was made and relevant data was entered for comparison of nighttime and daytime management in mechanically ventilated children.

Daytime and nighttime shifts were divided into equal 12 hours period. Daytime shift was defined as duration between 8 am to 7:59 pm and nighttime shift was defined as duration between 8pm to 7:59 am.

During these shifts various parameters were taken into consideration and compared. The parameters studied were as follows[12-14]:

Peak inspiratory pressure (PIP): It reflects the highest pressure recorded during the inspiratory phase of mandatory breaths

Mean airway pressure (MAP): Correlates with the mean alveolar pressure and represents stresses applied to lung parenchyma during ventilation

Fraction of oxygen inspired (FIO2): Amount of oxygen in the inspired gas mixture

SPO2: Also called oxygen saturation, it is the amount of oxygen saturation of hemoglobin in arterial blood

Vasoactive -inotropic score (VIS)[15,16]: It is the quantity of sum of all inotropes and vasoconstrictors administered reflecting pharmacological support to cardiovascular system.

Extubation Failure: Inability to sustain spontaneous breathing after removal of an artificial airway leading to reintubation within 24 to 72 hours.[30]

Extubation failure was attributed to the shift in which the decision to extubate was taken and the process of extubation was carried out.

Diuretic: Any drug that promotes diuresis, leading to increased urination.

All ventilator parameters, fluid boluses and diuretic usage are routinely charted in the nurses progress chart in tabulated manner on an hourly basis. The average of each individual parameter studied was calculated seprately for day and night shifts and entered for each day. The final average for the number of days stayed was calculated and entered on the proforma for each patient. The difference between the parameters studied between the day and night shift was analyzed using appropriate statistical methods.

STATISTICS:

The data were presented using range, mean ± standard deviation (SD), median with interquartile range (IQR), frequencies, and relative frequencies (percentages) as appropriate. Normality of the data distribution was assessed using the Kolmogorov-Smirnov test. Continuous variables were compared between day and night shifts using the Wilcoxon sign rank sum test for non normaly distributed data and paired t test for normally distributed data. Categorical data were analyzed using the Chi-square test and McNemer-Bowker test. Statistical significance was set at a p-value less than 0.05. All statistical analyses were performed using SPSS version 21.0 for Windows (SPSS Inc., Chicago, IL, USA).

OBSERVATIONS AND RESULTS

This prospective observational study was conducted over a period of 15 months (November 2022 to January 2024) in patients admitted to the PICU of a tertiary care centre. A prospective observational study was done on critically ill children (1 month- 18 years) requiring mechanical ventilation.

This study was carried out in PICU of department of Pediatrics, Dayanand Medical College and Hospital, Ludhiana. Total number of patients included were 120. Observation and results are as follows:

TABLE 1: DISTRIBUTION OF PATIENTS ACCORDING TO AGE (n=120)

AGE GROUP	No. of cases	Percentage
< 1 year	36	30.0%
1-5 year	33	27.5%
6-10 year	21	17.5%
> 10 year	30	25.0%
Total	120	100.0%

Maximum number of patients were in less than 1 year group followed by more than 10 years

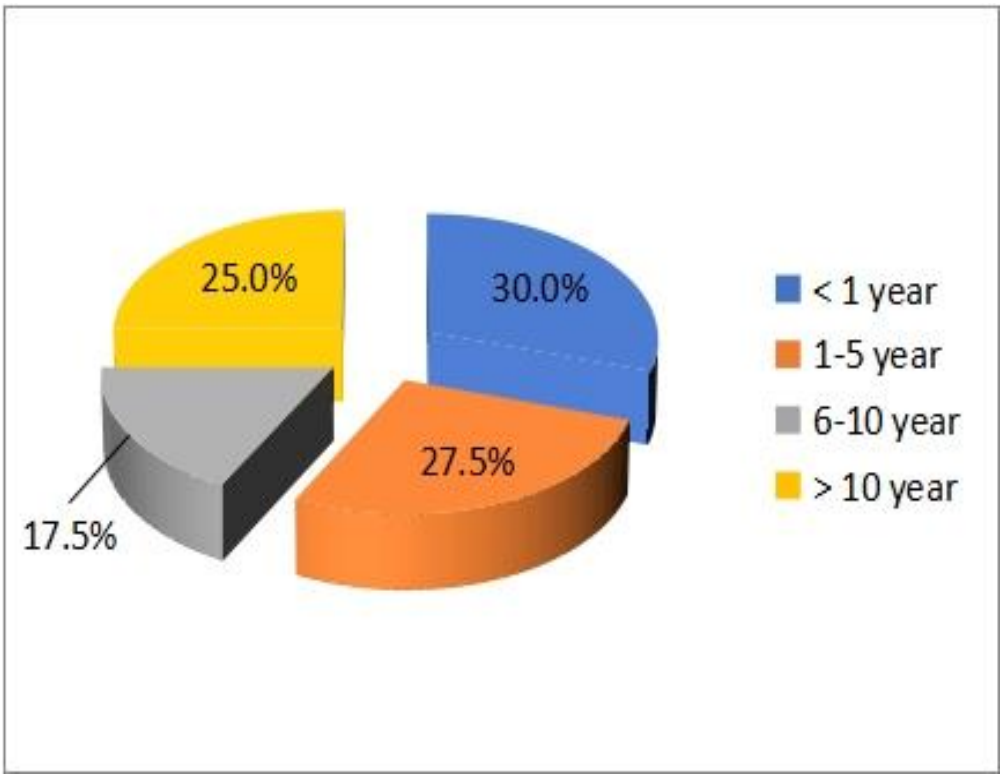

FIGURE 1: DISTRIBUTION OF PATIENTS ACCORDING TO AGE (n=120)

Table 2 – DISTRIBUTION OF PATIENTS ACCORDING TO GENDER (n=120)

Sex	No. of cases	Percentage
F	47	39.2%
M	73	60.8%
Total	120	100.0%

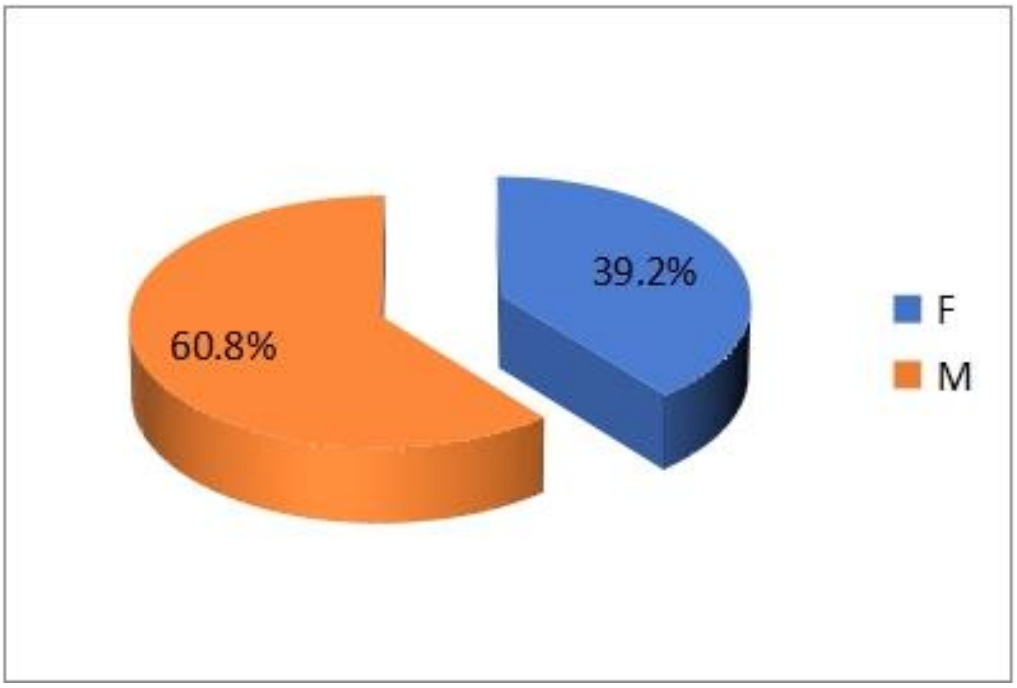

FIGURE 2 – DISTRIBUTION OF PATIENTS ACCORDING TO GENDER (n=120)

TABLE 3: DISTRIBUTION OF PATINETS ACCORDING TO THE SYSTEM INVOLVED

SYSTEM	No. of cases	Percentage
RESPIRATORY	38	31.7%
CENTRAL NERVOUS	25	20.8%
ABDOMEN	24	20.0%
OTHERS	23	19.2%
HEMAT ONCOLOGY	7	5.8%
CVS	5	4.2%

Out of all system involved maximum number were in the respiratory section followed by CNS

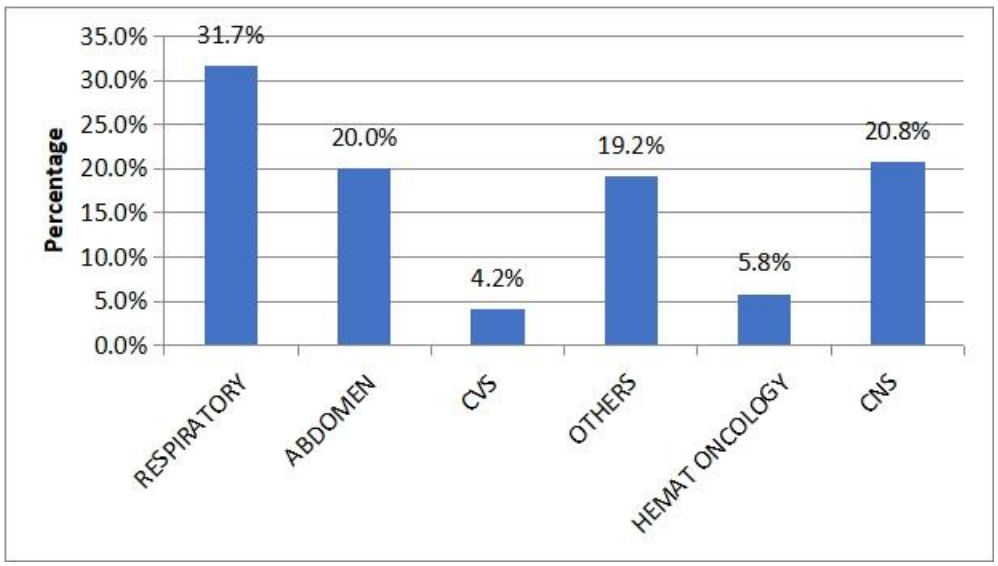

FIGURE 3: DISTRIBUTION OF PATIENTS ACCORDING TO ORGAN SYSTEM INVOLVED

TABLE 4: COMAPRISON OF MEAN PEAK INSPIRATORY PRESSURE (PIP) ACHIEVED DURING DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95 % CONFIDENCE INTERVAL
	Median(IQR)	Median(IQR)		
MEAN PIP (cm H20)	19.85 (17-23.75)	19.35 (17-24)	0.719	-0.15 to 0.19

Mean PIP for day was 20.22 (SD 4.59) while for night was 20.20 (SD 4.93)

No significant difference was found between day and night shift for PIP (p= 0.719)

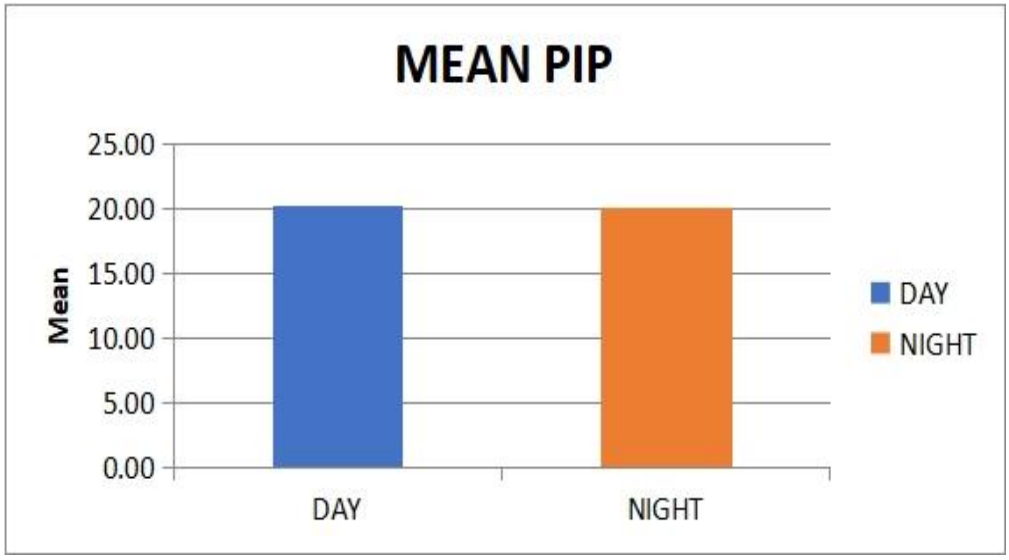

FIGURE 4: MEAN PIP DAY VERSUS NIGHT SHIFT

TABLE 5: COMPARISON OF FRACTION OF INSPIRED OXYGEN (FIO2) DELIVERED BETWEEN DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95 % CONFIDENCE INTERVAL
	Median (IQR)	Median (IQR)		
MEAN FIO2	30 (25-49.87)	31.15 (25-52.52)	**0.004**	-1.95 to -0.56

Mean Fraction of Inspired oxygen (FIO2) for day was 41.52 (SD 23.93) while for night was 42.78 (SD 25.19)

Significant was found between FIO2 delivered between day and night shift (p=0.004)

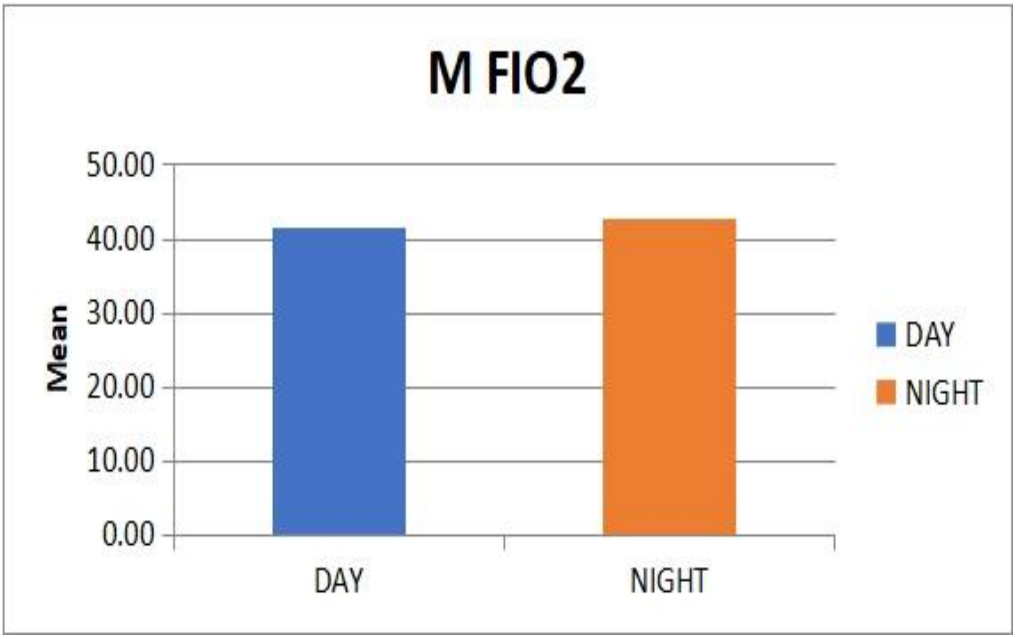

FIGURE 5: MEAN FIO2 DELIVERED BETWEEN DAY AND NIGHT SHIFT

TABLE 6: COMPARISON OF DELIVERY OF MEAN AIRWAY PRESSURE (MAP) BETWEEN DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95% CONFIDENCE INTERVAL
	Median(IQR)	Median(IQR)		
MEAN MAP (cm H2O)	10.8 (9.8-13.27)	10.75 (9.5-14)	**0.022**	-0.40 to -0.03

MEAN AIRWAY PRESURRE (MAP) for day was 11.80 (SD 3.17) while for night was 12.02 (SD 3.49)

Significant difference was found between day and night shift. More pressure were delivered during day shift(p=0.022)

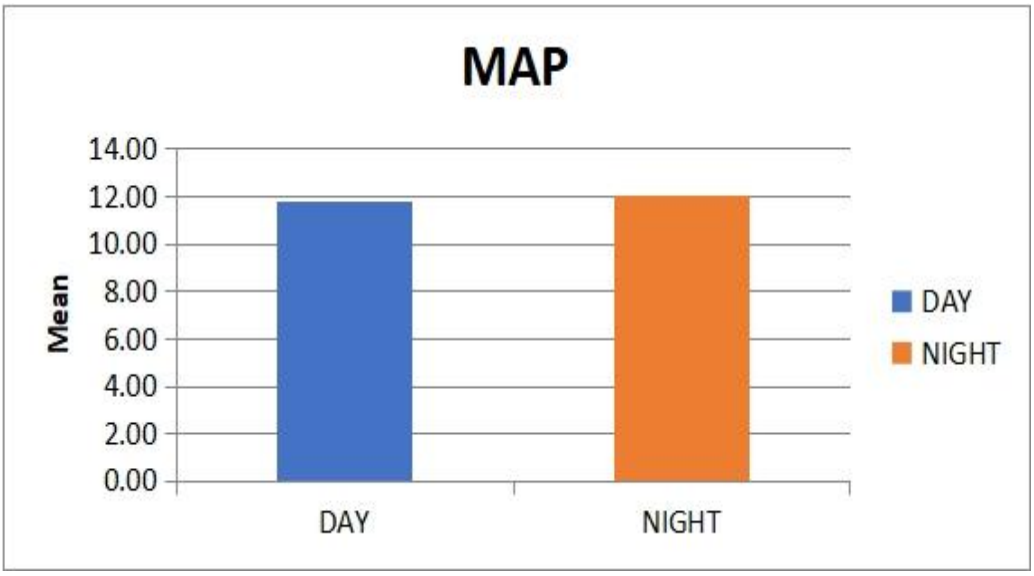

FIGURE 6: COMPARISON OF MAP DELIVERED BETWEEN DAY AND NIGHT SHIFT

TABLE 7: COMPARISON OF MEAN SPO2 ACHIEVED BETWEEN DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95% CONFIDENCE INTERVAL
	Median(IQR)	Median(IQR)		
MEAN SPO2	94.5 (93-95.45)	94.2 (93-95)	**0.001**	0.23 to 0.65

Mean SPO2 for day was 93.79 (SD 2.56) while for night was 93.35 (SD 3.17)

It was found that higher SPO2 could be achieved during day shift (p=0.001)

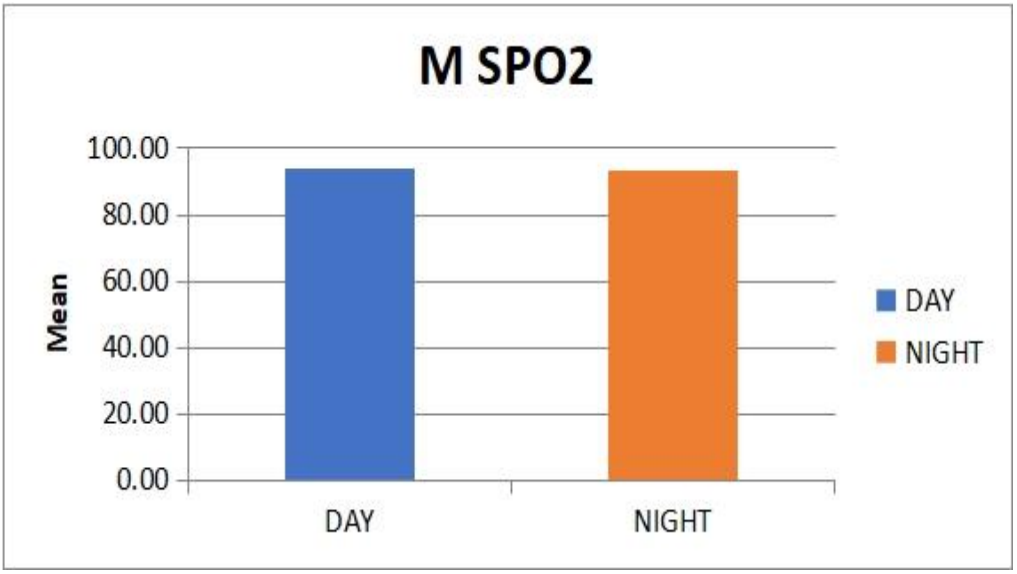

FIGURE 7: COMPARISON OF MEAN SPO2 ACHIEVED BETWEEN DAY AND NIGHT SHIFT

TABLE 8: COMPARISON OF DIURETIC USAGE BETWEEN DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95 % CONFIDENCE INTETVAL
	Median(IQR)	Median(IQR)		
MEAN DIURETIC USAGE (mg/kg)	0 (0-0.2)	0.3 (0.2-0.5)	**0.001**	-0.40 to -0.13

Mean diuretic usage for day was 0.21(SD 0.45) while for night was 0.47 (SD 0.43)

It was found more diuretic was used during the night shift

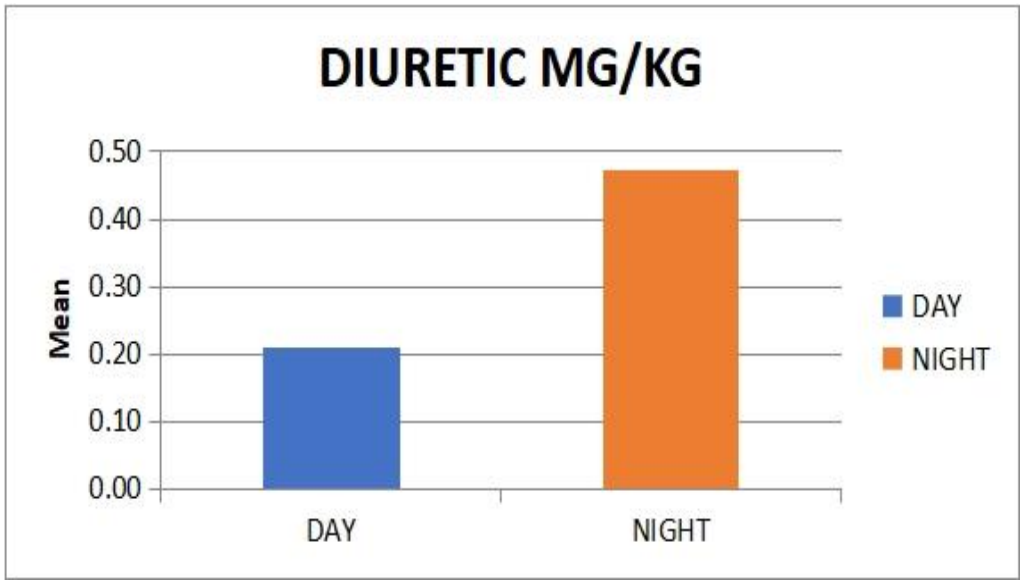

FIGURE 8: COMPARISON OF DIURETIC USAGE BETWEEN DAY AND NIGHT SHIFT

TABLE 9: COMPARISON OF BOLUS GIVEN (ml/kg) BETWEEN TWO SHIFTS

	DAY	NIGHT	p-value	95 % CONFIDENCE INTERVAL
	Median (IQR)	Median (IQR)		
BOLUS GIVEN (ml/kg)	1.4 (1-3.1)	0 (0-1.25)	**0.002**	0.28 to 1.86

Mean bolus given were 2.08 for day while 1.00 for night shift

It was found that more boluses were given during dayshift

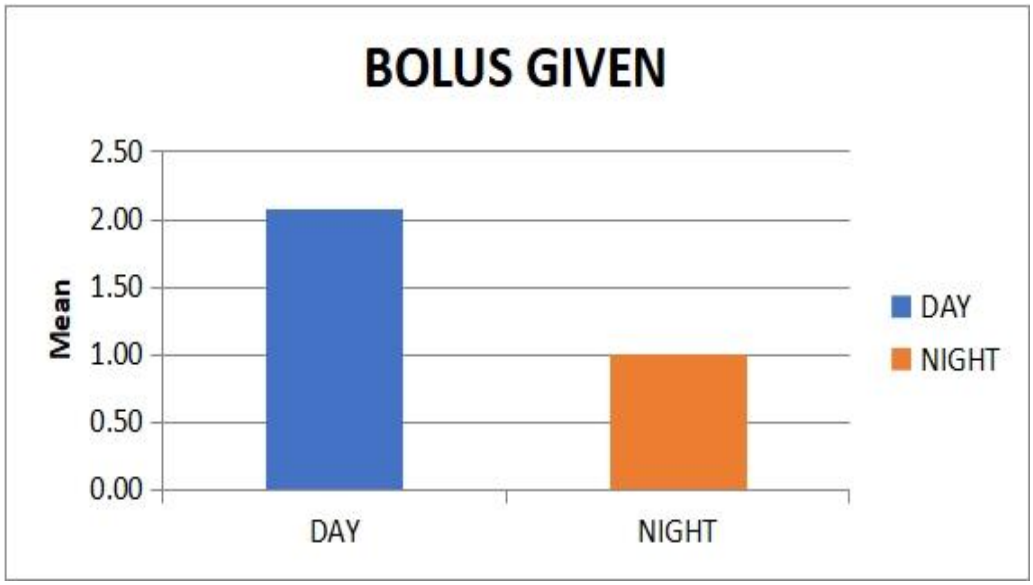

FIGURE 9: COMPARISON OF BOLUS GIVEN (ml/kg) BETWEEN TWO SHIFTS

TABLE 10: COMPARISON OF VASOACTIVE INOTROPE SCORE BETWEEN DAY AND NIGHT SHIFT

	DAY	NIGHT	p-value	95 % CONFIDENCE INTERVAL
	Median(IQR)	Median(IQR)		
Vasoactive inotropic score (VIS)	79.75 (23.05-131)	100 (37.95-170)	**0.001**	-33.29 to -15.51

Mean VIS for day was 82 (SD 59.38) while for night was 106.39 (SD 69.89)

It was observed that inotropes utilization was statistically significant usage more during night

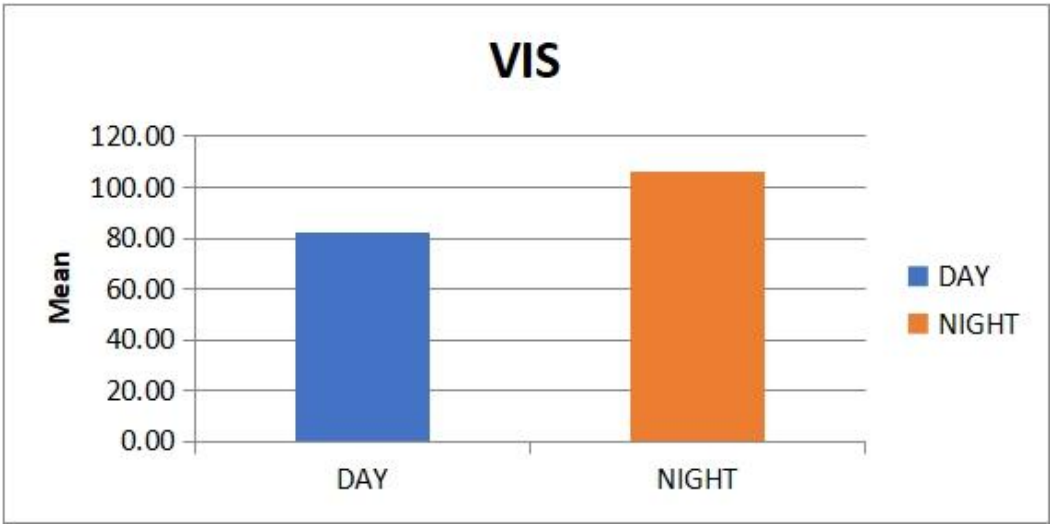

FIGURE 10: COMPARISON OF VASOACTIVE INOTROPIC SCORE BETWEEN DAY AND NIGHT SHIFT

TABLE 11: COMPARISON OF ACCIDENTAL EXTUBATION DAY VERSUS NIGHT SHIFT

		ACCIDENTAL EXTUBATION NIGHT		Total	p-value
		NO n(%)	YES n(%)		
ACCIDENTAL EXTUBATION DAY	NO n(%)	109(90.83)	8(6.66)	117	0.227
	YES n(%)	3(2.5)	0(0)	3	
Total		112	8	120	

Out of total 11 accidental extubations 3 (2.5 %) occurred in day shift 8 (6.66%) occurred during night shift

No significant difference was found between day and night shift of accidental extubation. (p=0.227)

TABLE 12: COMPARISON OF FAILURE OF EXTUBATION PLANNED DURING DAY VERSUS NIGHT SHIFT

		EXTUBATION FAILURE NIGHT		Total	p-value
		NO	YES		
EXTUBATION FAILURE DAY	NO n (%)	114(95)	1(0.83)	115	0.219
	YES n (%)	5(4.16)	0(0)	5	
Total		119	1	120	

Out of total 6 extubation failures 5 (4.16 %) occurred in day shift while 1 (0.83%) occurred during night shift. No significant difference was found between day and night shift of extubation failure

TABLE 13: COMPARISON OF MORTALITY DAY VERSUS NIGHT SHIFT

		MORTALITY NIGHT		Total	p-value
		NO	YES		
MORTALITY DAY	NO n(%)	87(72.5)	20(16.66)	107	0.296
	YES n(%)	13(10.83)	0(0)	13	
Total		100	20	120	

Out of total 33 mortalities 13 (10.83%) occurred in dayshift while 20 (16.66%) occurred during nightshift

No significant difference was found between mortality in day and night shift (p=0.296)

DISCUSSION

The present study was conducted in the PICU of Dayanand medical college and hospital, Ludhiana in critically ill children requiring mechanical ventilation. Our study found statistically significant difference with regard to mean diuretic usage, mean airway pressure ,vasoactive agent usage and FIO2 utilization; night time usage being significantly higher compared to daytime.

Age Distribution:

In the current study, maximum number of children were in age group less than 1 year, n=36 (30%) followed by 1-5 year, n=33 (27.5 %), mean age was 5.8 years. The mean age of study conducted by Parveen Khilani et al [31] was 3.4 years. In a retrospective cohort study done by Graziela et al [32] was The median age was 31 months

Gender Distribution:

In the present study out of 120 patients enrolled, there were 47 (39.2%) females and 73 Males (60.8%).

PRISM Score:

Prism score was taken at time of admission and mean came out to be 13.3. Maximum Prism score was 32 and minimum was 4. In mortality group our median Prism score was 15 for both day and night while patients who were discharged score was 12.

In a retrospective cohort study done by Graziela et al [31] was the median Prism score for patients who died was 15 while for survivors was 7.

Distribution of Patients according to the organ system involved:

Out of all organ system, the maximum number of patients were respiratory 38(31.7%) followed by CNS compromising 24 (20.8%) Abdominal system compromised 24(20 %), Infectious disease 13(10.8%), Hemat-oncology 7(5.8%), CVS 5 (4.2%) and miscellaneous

as 8.3 %.The miscellaneous group constituted drowning, surgical cases etc.

Comparison with other studies:

Jeremy M. Loberger et al. conducted a retrospective cohort study in a 24-bedded tertiary care PICU to compare the outcomes of daytime versus nighttime extubation among 517 mechanically ventilated children. The study found that the extubation failure rate was 10.3% for the day shift and 8.1% for nighttime (p=0.40). Logistic regression analysis at the individual patient level indicated that the shift during which the patient was extubated did not independently predict extubation failure. Based on these findings, the study concluded that the timing of extubation (daytime versus nighttime) was not associated with a higher risk of extubation failure.[19]

Similarly A retrospective cohort study was conducted by Bryan R. Tischenkel at 2 tertiary care academic hospital to compare daytime versus night time extubations in adult ICU. They had taken total 2240 extubations out of which 1555 were extubated during daytime and 685 during nighttime. Of these extubated during day 119(7.7%) got reintubated within 24 hours while 26 (3.8%)got reintubated within 24 hours who were extubated during nighttime. The elihood of getting reintubation was less for nightime than daytime after multi variable adjustment(OR 0.7,95% confidence interval 0.3-0.9,p= 0.01,similar trend was seen for reintubation after 72 hours (OR 0.6,95% CI=0.3-1.0 ,P=0.06).They concluded that nighttime extubation did not have higher likelihood of reintubation[22]

Although in our study more number of extubation failures occurred during day-shift however no statistically significant difference between the day and night shift-time.

Vijai Williams et al. from the Postgraduate Institute of Medical Education and Research, Chandigarh, conducted a systematic review

and meta-analysis to investigate the relationship between the time of admission and mortality rates among critically ill children admitted to PICU. They systematically searched electronic databases such as PubMed, Embase, and others for studies reporting in-hospital mortality and admission times to PICU for patients under 18 years old. Meta-analysis was conducted to analyze the findings.Their systematic review revealed that there was no significant difference in the odds of mortality between admissions during daytime versus nighttime, or between admissions during regular hours versus off-hours..[21]

Similarly, another retrospective cohort study was done in 15 PICUs by Yeseli Arias et al, the study found that patients admitted during evening hours had higher odds of death (OR 1.28);95% CI (1.65-10.1) than those admitted during the daytime hours. It was found that there was no association between mortality rates and day of admission.[27]

Another retrospective study was done by Ali Ertug Arslankoylu et al in PICU of Dogramaci children's hospital from November 2005 to April 2006 analysing 210 consective admissions to see whether any association between time of admission and rate of mortality. They found no association between timing of admission and mortality rates.[28]

However, we compared the occurrence of mortality related to the shift in which death occurred and was not based on association of mortality according to the shift in which admission took place. Although the percentage of morality was higher during night shift, however there was no statistically significant difference in daytime versus nighttime mortality in our study.

It was found in our study that higher spo2 could be achieved during day time despite significantly lesser use of FIO2 which could be because of better usage of ventilatory pressures during the day in preference to using higher FIO2 to achieve spo2 levels. This shows that better

oxygenation was achieved in ventilated children during day time likely due to better planning and implementation of ventilatory strategies rather than excessive use of oxygen, thus avoiding oxygen toxicity and its complications.

The greater use of vasoactive agents and diuretics during night may be due to either over zealous targets for hemodynamic stability and fluid balance compared to day time shift or greater sickness of the patients during night shift.

Even though the percentage of accidental extubation were higher during the day there was no statistically significant difference between day and night shift. This shows that level of vigilance and care of ventilated patient was comparable between day and night shift. The percentage children who died was higher during night but statistically significant.

SUMMARY & CONCLUSION

The study revealed that there was significantly greater utilization of PICU resources like vasoactive agents (inotropes) and diuretics during the night.

With regard to mechanical ventilation, greater utilization of Mean Airway Pressure (MAP) and lesser usage of oxygen was observed during daytime. Ventilated children attained better oxygenation (SPO2) during the day despite lesser delivery of oxygen(Fio2)

Overall, the night shift was marked by more aggressive and overenthusiastic utilization of PICU resources and daytime care appeared to involve a more conservative approach and planning

LIMITATIONS

Since the existing available literature on this subject is very scanty and indirect, we could not make sufficient head to head comparison with other studies.

Larger Sample size with multicentric studies could remove bias related to care of ventilated children

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